USEFUL INFORMATION

FOR

COTTON MANUFACTURERS.

Compiled and Issued

by

STUART W. CRAMER,

Mill Architect and Engineer.

Contractor for

Cotton Mill Machinery

and Equipment.

MAIN OFFICE:
Trust Building,
Charlotte, N. C.

BRANCH OFFICE:
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SECOND EDITION.

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Limited Edition.

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PRINTERS,
Charlotte, N. C.

ANNOUNCEMENT.

The above cut illustrates the **Trust Building** just completed at Charlotte, N. C., in which **our offices** are located on the **first floor**.

Our new **draughting rooms** on the **top floor** of this building afford us ample room, light, and other facilities for the proper carrying on of this department of our business, the extent and importance of which will be realized when we call attention to the fact that we have made plans and specifications for over one hundred Southern cotton mills and have installed in them complete outfits of machinery and equipment, not to mention the additional detailed draughting that has been required in connection with the machinery and equipment that we have furnished to practically as many more mills designed by other engineers or by the mill officers themselves

We also call attention to our **Branch Office** in the **Equitable Building, Atlanta, Georgia**.

Our customers and friends are cordially tendered the use of our offices as headquarters when in either Charlotte or Atlanta.

STUART W. CRAMER,
Agent for

THE WHITIN MACHINE WORKS,
WOONSOCKET MACHINE AND PRESS COMPANY,
KITSON MACHINE COMPANY,
ETC., ETC.

Preface to the Second Edition.

The first edition of this Handbook was issued in 1898; the demand for it was such that the edition was very soon exhausted. It was realized almost before the books left the hands of the printer that a mistake had been made in condensing the subject matter to within such narrow limits, notwithstanding the fact that it was a convenience to have a book small enough to carry in the pocket.

This second edition, therefore, has not only been revised and rewritten, but also greatly enlarged. In order that it may still retain its character as a handbook, it is bound in three volumes. The division of the subject matter is indicated by the "Summary of Contents" on page viii. No attempt has been made to keep even the separate volumes within pocket book size: it is rather intended for the desk use of cotton manufacturers, with special regard to those using the makes of machinery that I sell. This book being published exclusively for the Southern trade, I have included nothing pertaining to mule spinning other than a production table, as there is so little mule spinning in the South it hardly warrants the space that would be required to exploit it in the same comprehensive manner that has been devoted to ring spinning.

As the cotton mills of the South go more largely on to fancy goods, it has seemed more desirable to issue supplements keeping abreast of what the trade demands than to attempt to do more than treat that part of the subject in a general sort of way, at the present time.

It may be briefly said, therefore, that these volumes cover only the machinery and equipment required for a modern cotton mill manufacturing either yarn or plain cloth, with a chapter on dyeing and special finishing, winding up with miscellaneous matter pertaining to cotton and its manufacture, mill engineering, etc.

As to originality in this work, it is advanced as the latest and most complete compendium of technical data compiled from the best authorities available, with such new matter, alterations, and modifications as our own large experience suggests, derived from furnishing the machinery and greater part of the equipment for mills in the South aggregating over one and a half million spindles,—not to mention miscellaneous orders for half as much more furnished direct by the shops I represent before my connection with them.

For the convenience of tracing a complete equipment straight through the mill, the subject matter is arranged consecutively and corresponding thereto, commencing with the picker room. At the end of each volume will be found a "Table of Contents." In the back of Volume III. an alphabetical index will also be found for ready reference.

As a matter of course, I have drawn liberally from the catalogues of—

The Whitin Machine Works,

Kitson Machine Company, and

Woonsocket Machine and Press Company,

and from those of the other shops for which I am the selling agent.

I have also freely availed myself of the Draper Company's permission to borrow from their "Textile Texts" such tables and other information as it has seemed desirable to have appear in this work; their courtesy will doubtless be appreciated as much by the users of this hand-book as by myself.

Finally, I desire to acknowledge the many courtesies extended to me directly and indirectly in this work by my professional friends: among whom I would particularly mention Messrs. C. R. Makepeace, J. A. Brock, J. W. Cannon, W. F. Cox, L. D. Duval, Wm. Entwistle, F. H. Fries, T. B. Fuller, John Gilligan, George A. Gray, J. H. Hamilton, C. W. Johnston, G. T. Kinnett, R. E. Ligon, Z. T. McKinney, R. M. Miller, Jr., T. E. Moore, J. D. Moore, Jas. L. Orr, S Odenheimer, J. S. Pleasants, A. B. Saunders, J. E. Shea, Ellison A. Smyth, F. I. Stone, S. B. Tanner, A. H. Twichell, J. O. White, W. H. Williamson, and B. E. Willingham.

STUART W. CRAMER.

March 31, 1904.

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The Textile Machinery ordinarily installed in a yarn or cloth mill on plain work.

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Section II.:

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Appendix.

Volume III.

Section III.:

Dyeing and Special Finishing Machinery.

Section IV.:

Cotton and Its Manufacture, Mill Architecture and Engineering, with General Technical and Miscellaneous Information.

Index:

An Alphabetical Index for all three volumes.

* A Table of Contents will be found at the end of each volume.

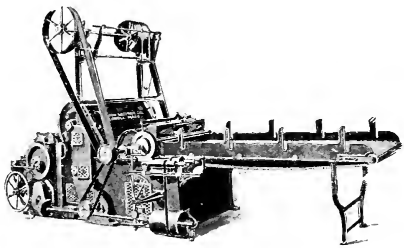
SECTION I.

The Textile Machinery Ordinarily Installed in a Yarn or Cloth Mill on Plain Work.

LATEST IMPROVED PICKING MACHINERY,

Manufactured by

Kitson Machine Company.

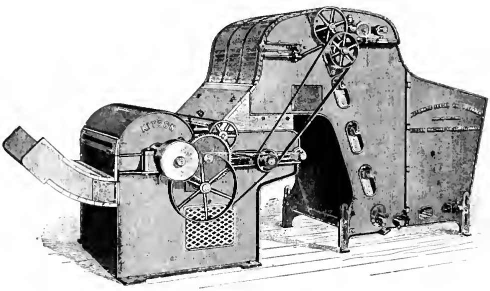


One Beater Finisher Lapper.

The "**Three Process" System of Picking** introduced and advocated by this Company has now been almost universally adopted—a modern, up-to-date plant consisting of one or more "sets" of machines, each comprising a single beater breaker with opener and feeder connected thereto by suitably designed trunks, or a breaker with feeder attached direct: a single beater intermediate lapper with apron for four laps up, and a single beater finisher lapper with apron for four laps up. Such a system gives 16 doublings, and beats the cotton only three times, instead of only 4 doublings and beating it four times, as in the old style system of "Two Processes," consisting of only two machines, each a two beater. Lappers are made in 36, 40 and 45-inch widths.

The Kitson Machine Company's **Blowing System for conveying raw cotton** from an opening room in the warehouse to the picker room in the mill, is fully described in Section IV., Volume III., under the heading "Mill Engineering."

Kitson Picking Machinery, Continued.



O. 7 Opener with Automatic Feeder.

FEEDERS, OPENERS AND TRUNKS.

Automatic Feeders.—These machines are constructed entirely from new models and furnished complete with all necessary connections, to be attached to any make of opener or lapper.

Cotton Openers.—The O. 7 machine has almost entirely displaced that of other patterns: it has a three-blade beater 20 in. in diameter with ample grid surface for large cleaning capacity. It has 2½-inch feed rolls—short apron and rails to receive feeder, and direct connections for driving same, with automatic device for starting and stopping the feed of both, controlled by knock-off on the lapper. The evener, when applied to this machine in connection with the automatic feeder, automatically controls the amount of cotton being delivered, regardless of whether the hopper is full, half full or nearly empty.

The amount of cotton passing through the evener rolls regulates the speed of the lifting apron in the feeder, and as the quantity of cotton in the hopper grows less the lifting apron and also feed rolls on opener are correspondingly increased in speed, so that the quantity delivered to the beater is always the same. We have several patents covering this arrangement, and any device wherein the speed of lifting apron is automatically varied would be an infringement thereof.

Kitson Picking Machinery, Continued.

Cylinder Openers.—Previous to the introduction of the Automatic Feeder, opening machinery was required to handle cotton in a hard, matted condition, directly from the compressed bale. The cylinder opener was designed particularly to meet these conditions and is now furnished when called for.

Although modern conditions are fully met by the new O. 7 opener, we are prepared to build this type of machine with either 20″ or 31″ Buckley style cylinders as a substitute for the 3 blade 20″ beater if desired.

The Perham Patent Inclined Cleaning Trunk.—All cotton contains more or less light dirt and leaf which cannot be entirely removed by the lappers, as the fan draught essential to the formation of a good sheet on the screens carries much of the lighter refuse along with the cotton. By passing the cotton over a fine grid surface, at a slow velocity, all foreign matter that is heavier than the cotton will gradually settle, and trunk systems afford efficient means for the collection and removal of this light refuse.

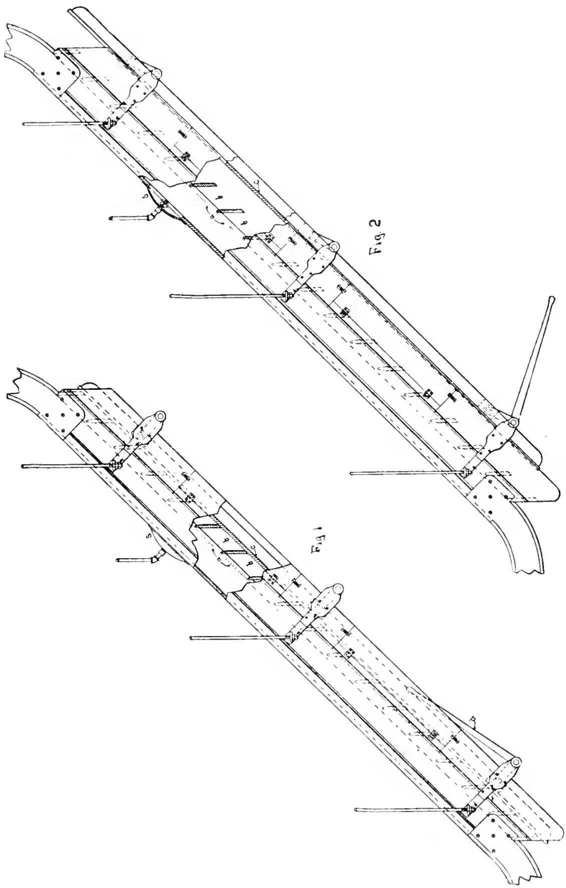
The most compact and efficient of these arrangements is illustrated on the next page.

The cotton slowly passing over the transverse slats or grids **a**, the foreign matter falls between them and is collected in the pockets **b**. This separation is further increased by the inclined position of the grid surface, as it will be noted that each slat or grid is a little higher than the preceding one, so that it presents a narrow surface against which the dirt impinges and is retarded, causing it to fall between the grids to the pockets.

A bottom for all the pockets is formed by a cover **c**, which extends the whole length of the trunk, and is shown closed in Fig. 1.

The trunk can be instantly cleaned by bringing the lever **d** to position shown in Fig. 2, which removes the cover **c** from all the pockets and the dirt slides down the incline to a box placed at the bottom to receive it, or, as is frequently the case, directly to dust room, through a connection we make for that purpose.

Kitson Picking Machinery, Continued.



Perham's Patent Inclined Cleaning Trunk.

Kitson Picking Machinery, Continued.

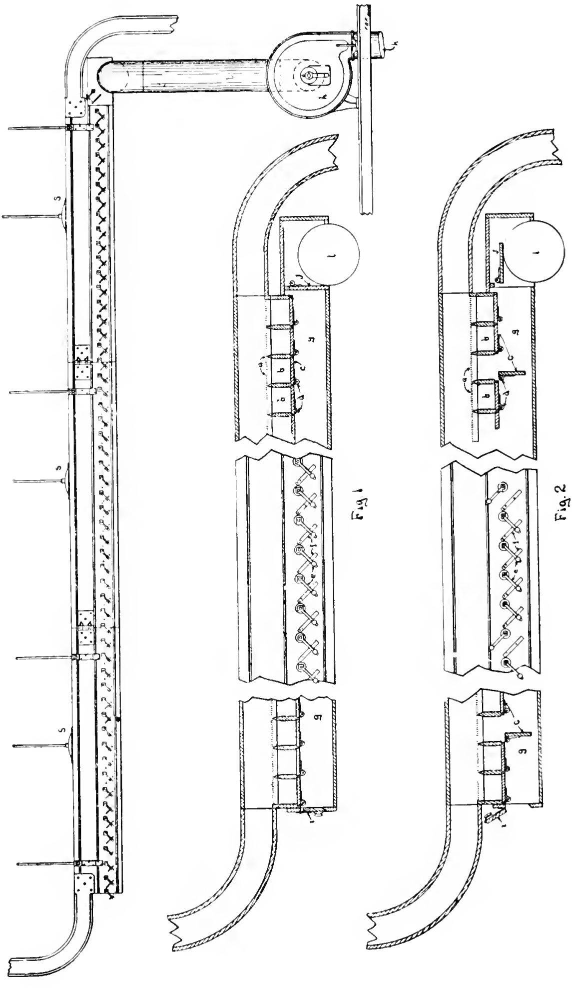
The Robinson Patent Cleaning Trunk.—A style of trunk which has superseded the common horizontal trunk is shown in Figs. 1 and 2 on the next page. Its chief point of superiority is due to ready means afforded for disposing of the refuse which collects in the pockets. As the cotton slowly passes over the grid surface **a**, the dirt settles into the pockets **b**, the bottoms of which, it will be observed, are hinged at **d**. To the hinge of each is fastened a handle **e**, which is held in its proper closed position by the spring **f**. Below the pockets is a passage **g** connected to a fan **h**, and having at each end a door **i** and **j**, so that any one of a set of from 1 to 6 trunks may be connected at will with the fan which is arranged to clean out the whole number.

Considering the illustration to represent one of a set of trunks, its operation is as follows: having started the fan, both doors **i** and **j** are opened as shown in Fig. 2, producing a current of air through the passage **g**. Pressing the spring **f** releases the bottom **c** of the pockets, which swings to open position shown in Fig. 2, allowing refuse to fall, and it is carried along by the air current through the pipe **l** to the fan, and discharged through the pipe **k** to dust room below.

Patent Sprinkler.—Nearly all fires in picker rooms are caused by foreign bodies carried along by the cotton, and usually start at the opener where hard substances first come in contact with the beater. When desired we can place on top of the cleaning trunk at suitable intervals, convex domes holding sprinkler heads, so that a very slight fire will cause the sprinklers to open and extinguish it in time to prevent any damage whatever.

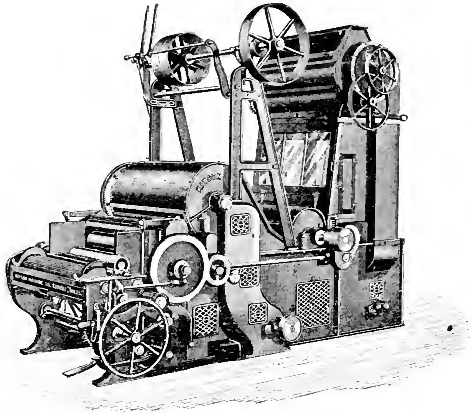
Such sprinkler connections are shown on the sections of cleaning trunks, pages 13 and 15; they are designated by the letter *s*.

Kitson Picking Machinery, Continued.



Robinson's Patent Horizontal Cleaning Trunk

Kitson Picking Machinery, Continued.



ONE BEATER BREAKER LAPPER.

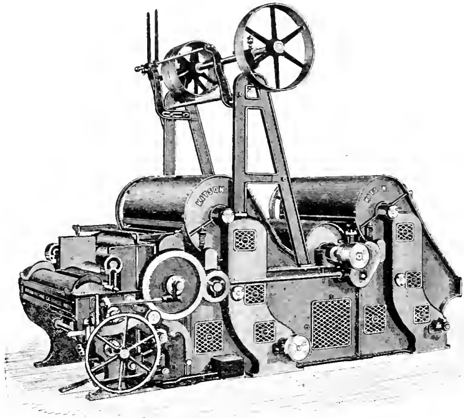
(With Condenser and Gauge Box Feed.)

Where the opening room is a considerable distance from the room in which the lappers are located it is customary to connect the openers with the Breaker Lappers by means of some form of trunk, and provide a suitable device to automatically stop the feed on the opener when doffing the laps, or otherwise stopping the Breaker Lapper. It is evident that there is a considerable quantity of cotton in transit between the opener and the lapper, which if not cared for, will produce an extra thick place in the next lap made and a correspondingly thin place following this, while the cotton is coming through the trunk to the lapper.

Any irregularity in the feed at the opener or variation due to the long distance traversed by the cotton, as well as the objections referred to above, are overcome by the arrangement here shown.

The condenser receives the cotton subject to the varying conditions and delivers it into the Gauge Box, which in effect amounts to a doubling or averaging of these variations, and from the gauge box it feeds in a uniform manner to the beater, producing a lap that is practically of the same weight, from which is eliminated the objections due to these varying causes. This arrangement is used in many cases where the Breaker Lappers are situated from 100 to 300 feet from the openers, and one to three stories above them. This machine is also built with two beater sections when supplying several intermediates, or when the intermediate process is cut out.

Kitson Picking Machinery, Continued.



ONE BEATER BREAKER LAPPER.

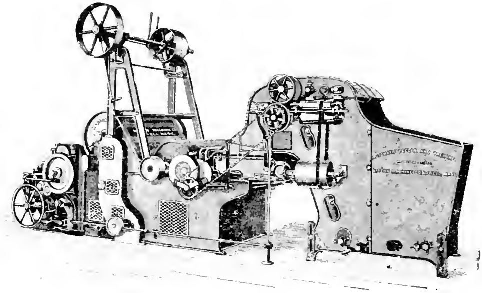
(With Screen Section.)

Where the connection from the Opener to the Breaker Lapper is short, as is quite often the case, where the Perham Inclined Trunk or a plain conductor is used, with the opener directly under the lapper, the objections referred to on the preceding page are very much lessened and may be disregarded, the only objection remaining being the thick and thin places caused by stopping the feed while doffing the laps, and this is very much reduced, owing to the small amount of cotton in transit, and may be entirely obviated by removing the dog on the knockoff mechanism and doffing the laps without stopping the feed.

Under such circumstances the Breaker Lapper with Screen Section here shown, gives very satisfactory results and makes a very neat connection to the openers. The screens in this section run at the same speed and form a sheet for beater exactly the same as in the first section of a two beater lapper.

They are built with either one or two beater sections as may be desired.

Kitson Picking Machinery, Continued.



ONE BEATER BREAKER LAPPER.

(With Automatic Feeder and Evener.)

In the treatment of long staple cottons many manufacturers reduce the number of beaters in a system to the lowest possible limit, apparently considering the beating process of the lappers a necessary evil that must be endured to put the cotton into the form of a lap, disregarding proper cleaning and picking.

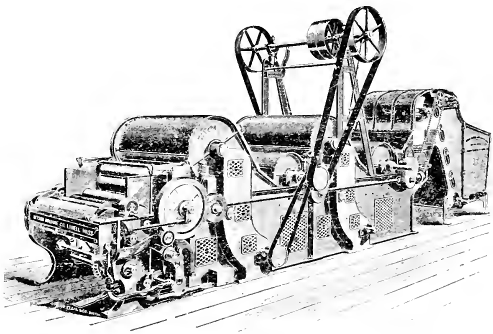
Their specification usually calls for a one beater breaker to be followed by a one beater finisher—only two beaters in the system.

This lapper meets their requirements, having 2½-inch feed rolls, three-blade beater 20 inches diameter. The beater boxes are made adjustable for varying lengths of cotton, and the cut-off is also adjustable so as to be brought into proper position whenever the beater is moved to or from the feed rolls.

The cut also shows our application of an Evener to regulate the delivery from the feeder to beater. Here it is doubly important, as it insures a uniform quantity being constantly fed to the beater, producing uniform picking as well as giving very even breaker laps for the finisher, which is quite essential where the intermediate process is dispensed with.

The construction and operation of the evener is substantially the same as described on a preceding page, in its application to our O. 7 Opener.

Kitson Picking Machinery, Continued.



TWO BEATER BREAKER LAPPER.

(With Automatic Feeder.)

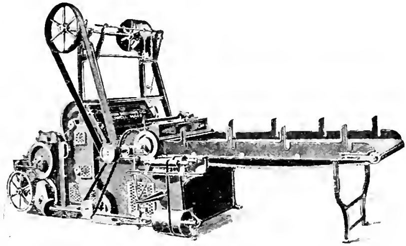
When the cotton is opened on the same floor on which the lappers are located, and no trunk is to be used, a straight Two Beater Breaker Lapper like cut makes a very compact combination, uniting as shown, the Feeder, Opener and Breaker Lapper in one machine.

The first section is substantially the same as our O. 7 Opener previously described having 2½-inch fluted steel feed rolls delivering the cotton to a three-blade 20-inch diameter beater.

The second or calender section has 2⅛-inch fluted steel feed rolls and a two-blade 16-inch diameter beater.

Where the nature of the work does not require the use of trunk this makes a most satisfactory machine for the first process. We occasionally build this with an additional section, making a three beater breaker lapper, where floor space is limited and a large production must be had.

Kitson Picking Machinery, Continued.



ONE BEATER FINISHER LAPPER.

(Also Intermediate Lapper.)

With the introduction of the revolving flat card and the general adoption of single carding came a demand for better picking and laps more uniform, both in weight and texture. This led to the three process system, using single beater Intermediate and Finisher Lappers as here illustrated.

This lapper is used both as an Intermediate and a Finisher. As an Intermediate, the beater is of the common two blade type, having drop forged arms turned and polished; the blade is made from extra hard quality of steel, and the shaft is of steel, running in heavy self-oiling bearings.

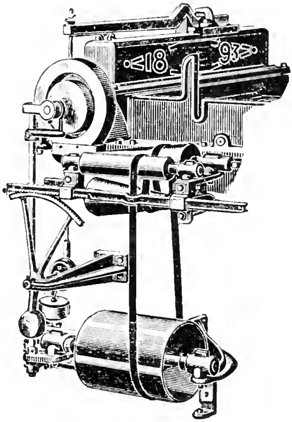
As a Finisher, nearly all our customers prefer the Kirschner Carding Beater as shown on a subsequent page.

For long staple cottons the cut-off and beater boxes are made adjustable.

It has four roll consolidated calender head, heavily weighted, the rolls being provided with flanges to produce a smooth, even selvage. A safety knock-off is provided, which prevents breakage in case any hard substance enters the roll. The rails are made to double four laps and the countershaft is furnished complete attached to the frame as shown.

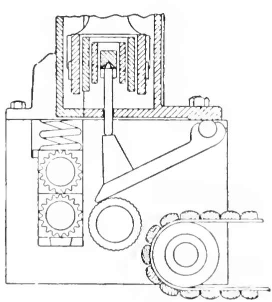
Kitson Picking Machinery, Continued.

To no part of a lapper has so much time and thought been devoted as to the evener. Demanding, as it does, an extreme sensitiveness to very slight variations in the stock passing through, it must respond quickly, positively and accurately to perform the functions for which it is designed. Add to this, that it must be simple in construction, durable and not liable to get out of order. All these requirements are fully met in the **Perham & Davis Sectional Plate Evener**, herewith illustrated.

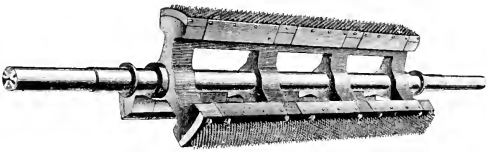


Recognizing the fact that no evener can be sufficiently sensitive in which the same roll is used both to even and pick from, we employ a separate roll in connection with the sectional plates to even from and a pair of rolls heavily weighted to pick from.

The rolls are geared to give a high belt speed on the cones, and this speed is maintained constant for all positions of the belt, as a novel form of cone frame enables us to use a drum instead of a cone as a driver. The belt is shipped at one point only and moves positively and quickly to change the speed of the rolls to correspond with the variations detected and equalized by the sectional plates. Provision is made for taking up the slack as the belt stretches from use. The evener is geared direct from the calender head, where the draught gear may be changed to produce a different weight of lap when desired. A fine adjustment is also provided by which a slight change can be instantly made as the condition of the stock may require.



Kitson Picking Machinery, Continued.

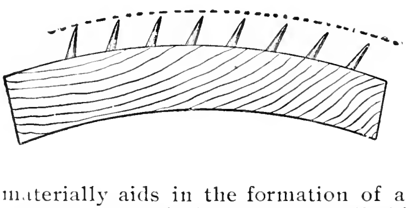


The Kirschner Patent Carding Beater.—There has long been a demand for some form of beater for finisher lappers the action of which on the cotton should approach the carding rather than the beating process, to which it is subjected with the usual form of blade beaters.

The evener has long since reached a state of perfection where little is to be desired as far as evenness is concerned, when the weight is taken either as a full lap or by the yard, but when compared inch by inch there remains a very considerable variation as is evident when the lap is held up before a window and unrolled.

This is in no way the fault of the evener, as the formation of a smooth even sheet on the screens is dependent on a finer sub-division of the staple than it is possible to attain with the ordinary knife beater in its best condition, doing the amount of work usually demanded by a lapper.

It will be observed that in the construction of the carding beater three lags are used and that each row of pins is farther from the centre than those immediately preceding it.

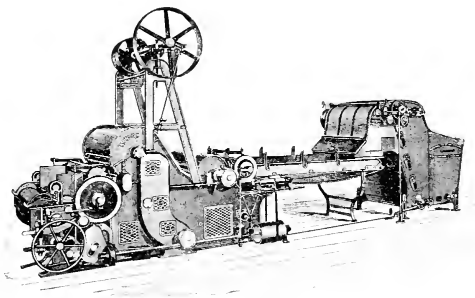


The united carding and beating action together with the progressive penetration combine to produce a very fine sub-division of the fibre, while the peculiar form of each blade or bar very materially aids in the formation of a uniform sheet on the screens. It entirely overcomes all objections heretofore existing in other forms of pin beaters. Its ready acceptance by leading manufacturers adds to our own unqualified recommendation of its use for all classes of work, as, without solicitation on our part, the orders for this beater have come in faster than we have been able to fill them for the past few years.

Caution.—Some of our competitors are offering an imitation of this beater, which can only be detected by noticing that the pins are all the same length and project equally

Kitson Picking Machinery, Continued.

from the lagging, instead of variably. They do not get the progressive penetration, which is the real point covered by our patents, and the only point of merit in the device. Without this progressive penetration, the scheme is harmful to the fibre of the cotton, and should not be considered for a moment.



COMBINATION BREAKER AND FINISHER LAPPER.

We occasionally have a call from parties starting small mills, or requiring for some special purpose a smaller production than the average capacity of a One Beater Breaker and a One Beater Finisher.

In such cases we can save them the expense of two machines by attaching the Feeder directly to the Finisher Lapper as here shown.

The raw cotton can be put into the Feeder and the machine run as a Breaker, say during the forenoon, and the laps thus made can be put back on the apron and the machine run as a Finisher in the afternoon.

The evener here used is the Clarke & Perham Patent Sectional Roll Evener, as raw cotton will not successfully feed through a sectional plate evener.

This machine is built either One or Two Beaters as may be desired.

Kitson Picking Machinery, Continued.

WASTE MACHINES.

No. 1 Roving Waste Opener.— All mills make more or less roving waste which must be reduced to fibre again. This machine is designed for mills where the quantity is small. The feed consists of a single steel roll, fluted and cross cut, having sectional feed plates under it, each of which is held firmly to the roll by a very stiff spring. The beater or cylinder has tempered steel pins set in our patent 3-ply lagging, backed up by a steel drum, mounted on a steel shaft, running in self-oiling boxes. The stock is received from the beater by a condensing drum and delivered by the apron in a light, well-opened sheet, properly prepared to be mixed with the regular work.

No. 3 Roving Waste Opener.—This machine is uniform in design with our lappers, and is a very heavy and substantial machine. It is for use in mills making a large quantity of roving waste. The roving waste is spread on an apron 24 inches wide, which delivers it to a pair of 2-inch feed rolls, both top and bottom rolls being positively driven by large gears and forced together by powerful springs. The cylinders are 31 inches in diameter, having tempered steel pins set in patent 3-ply lagging, properly backed up. The shafts are steel and run in self-oiling boxes.

Cop Waste Breaking Up Machine.—Under this class of machinery is built a machine similar to the No. 3 Roving Waste Opener, except that it is five sections long, having five cylinders, graded from coarse to fine for the purpose of breaking up and reducing to lint cop waste and hard spun yarns which cannot be worked on the No. 3 machine. It will reduce to lint in a most thorough manner about all the hard waste in a cotton mill, even to rag clippings so that the same can be put back into the mixing and be re-worked.

Kitson Picking Machinery, Continued.

Card and Picker Waste Cleaner.—In every mill there will accumulate a considerable quantity of waste from the card room, as dirty floor sweepings, droppings under cards, and from the picker house a large amount of refuse from the trunk system and beaters of openers and lappers which is of little value, but which if properly cleaned will repay all the expense of cleaning. Such waste will yield from 40 per cent. to 60 per cent. of clean fibre. The waste is placed in a hopper on top of the machine, being fed by hand through a narrow slot to the beaters, which extend the whole length. The beaters carry the stock over steel grids through which the dirt passes to large chambers formed by the lower parts of the machine. The stock is drawn to a condensing screen by a fan, and is delivered in a continuous sheet thoroughly opened and cleaned. This machine is sometimes equipped with a 24-inch automatic feeder attached, driven from the same countershaft, which greatly increases the capacity of the machine and the quality of the work; provision is made for taking out a large quantity of sand and heavier dirt before the stock goes to the beaters, and the uniform feed ensures the product being uniformly cleaned and delivered.

Thread Extractor.—From the scavenger rolls of mules and spinning frames comes a considerable quantity of valuable waste, containing hard twisted threads. To pick them out by hand is expensive and to put them through the card without removing the threads is ruinous to the clothing. This machine will extract the threads in a cheap and thorough manner. The condenser, bonnet, and base of the machine are each made in a single casting, and the beaters are also each a single solid steel casting running in self-oiling bearers.

Kitson Picking Machinery, Continued.

Draught Gear Table for Lappers.

Ounces per Yard of Lap at Calender.	Ounces per Yard on Aprons, Doubling Four Laps.									
	6	6½	7	7½	8	8½	9	9½	10	10½
6	29	27	25	23	22	20	19	18		
6½	31	29	27	25	23	22	21	20	19	18
7	34	31	29	27	25	24	22	21	20	19
7½	36	33	31	29	27	26	24	23	22	21
8	39	36	33	31	29	27	26	24	23	22
8½	41	38	35	33	31	29	27	26	25	23
9	43	40	37	35	33	31	29	27	26	25
9½	46	42	39	37	34	32	30	29	28	26
10	48	45	41	39	36	34	32	30	29	28
10½	51	47	43	41	38	36	34	32	30	29
11	53	49	45	42	40	38	35	34	32	30
11½	55	51	48	44	42	39	37	35	33	32
12	58	54	50	46	43	41	39	37	35	33
12½	60	56	51	48	45	43	40	38	36	34
13	63	58	54	50	47	44	42	40	38	36
13½	65	60	56	52	49	46	43	41	39	37
14	68	62	58	54	51	48	45	43	41	39
14½	70	65	60	56	52	50	47	44	42	40
15	72	67	62	58	54	51	48	46	43	41
15½	75	69	64	60	56	53	50	47	45	43
16	77	71	66	62	58	55	51	49	46	44
16½	80	74	68	64	60	56	53	50	48	46
17	82	76	70	66	62	58	55	52	49	47
17½	85	78	72	68	63	60	56	53	51	48
18	87	80	74	70	65	62	58	55	52	50

T = Teeth in draft gear $= \frac{115.5}{d}$

d = Draft of Intermediate or Finisher $= \frac{115.5}{T}$

Kitson Picking Machinery, Continued.

Draught Gear Table for Lappers.

(Continued.)

Ounces per Yard of Lap at Calender.	Ounces per Yard on Aprons, Doubling Four Laps.									
	11	11½	12	12½	13	13½	14	14½	15	15½
6										
6½										
7	18									
7½	20	19	18							
8	21	20	19	18						
8½	22	21	20	20	19	18				
9	24	23	22	21	20	19	19	18		
9½	25	24	23	22	21	20	20	19	18	
10	26	25	24	23	22	21	21	20	19	19
10½	28	26	25	24	23	23	22	21	20	20
11	29	28	27	25	24	24	23	22	21	21
11½	30	29	28	27	26	25	24	23	22	22
12	32	30	29	28	27	26	25	24	23	22
12½	33	32	30	29	28	27	26	25	24	23
13	34	33	31	30	29	28	27	26	25	24
13½	36	34	33	31	30	29	28	27	26	25
14	37	35	34	32	31	30	29	28	27	26
14½	38	36	35	34	32	31	30	29	28	27
15	39	38	36	35	33	32	31	30	29	28
15½	41	39	37	36	35	33	32	31	30	29
16	42	40	39	37	36	34	33	32	31	30
16½	43	42	40	38	37	35	34	33	32	31
17	45	43	41	39	38	36	35	34	33	32
17½	46	44	42	40	39	38	36	35	34	33
18	47	46	43	42	40	39	37	36	35	34

T = Teeth in draft gear $= \frac{115.5}{d}$

d = Draft of Intermediate or Finisher $= \frac{115.5}{T}$

Kitson Picking Machinery, Continued.

Draught Gear Table for Lappers.

(Concluded.)

Ounces per Yard of Lap at Calender.	Ounces per Yard on Aprons, Doubling Four Laps.								
	16	16½	17	17½	18	18½	19	19½	20
6									
6½									
7									
7½									
8									
8½									
9									
9½									
10	18								
10½	19	18	18						
11	20	19	19	18	18				
11½	21	20	20	19	19	18			
12	22	21	20	20	19	19	18	18	
12½	23	22	21	21	20	20	19	18	18
13	24	23	22	22	21	20	20	19	19
13½	24	24	23	22	22	21	21	20	20
14	25	24	24	23	23	22	21	21	20
14½	26	25	25	24	23	23	22	22	21
15	27	26	26	25	24	24	23	22	22
15½	28	27	26	26	25	24	24	23	22
16	29	28	27	27	26	25	24	24	23
16½	30	29	28	27	27	26	25	24	24
17	31	30	29	28	27	27	26	25	25
17½	32	31	30	29	28	27	27	26	25
18	33	32	31	30	29	28	27	27	26

T = Teeth in draft gear $= \frac{115.5}{d}$

d = Draft of Intermediate or Finisher $= \frac{115.5}{T}$

Kitson Picking Machinery, Continued.

SIZES OF PULLEYS, SPEEDS AND PRODUCTION OF PICKING MACHINERY.

(See also Production Table on next page.)

Lappers.—The countershaft on these Lappers is usually fitted with 18″ x 5″ tight and loose pulleys, and runs at 500 revolutions per minute.

Production of Openers and Breaker Lappers 3,000 to 4,000 pounds, and of Finisher Lappers 1,500 to 2,000 pounds per day of ten hours.

Roving Waste Opener.—Made in two sizes: No. 1 is fitted with countershaft having 8″ x 3″ tight and loose pulleys to run 750 revolutions per minute. No. 3 has countershaft with 18″ x 5″ tight and loose pulleys to run at 500 revolutions per minute.

Production of No. 1 is 500 to 600 pounds per day of ten hours; and of No. 3 is 2,000 to 3,000 pounds per day of ten hours.

Five Cylinder Cop Waste Breaking Up Machine.—Such a machine made with five sections is generally equipped with two countershafts, one on each end of the machine, each fitted with 20″ x 5″ tight and loose pulleys, running at 500 revolutions per minute.

The production of such a machine is about 900 pounds of hard waste per day of ten hours.

Card and Picker Waste Cleaners.—These machines are fitted with countershaft having 16″ x 4″ tight and loose pulleys to run at 500 revolutions per minute.

The production is 2,500 to 3,500 pounds of waste, floor sweepings, etc., per day of ten hours.

Thread Extractor.—Fitted with countershaft having 8″ x 2½″ tight and loose pulleys, to run at 680 revolutions per minute.

The production is about 500 pounds per day of ten hours.

"**Horse Power Required**"—See Index.

Kitson Picking Machinery, Continued.

Production Table for Lappers.

(Concluded on Next Page.)

(in lbs. per day of 10 hours.)

Diameter of Feed Pulley, in inches.	Weight of Lap in Ounces per Yard.									
	8	9	10	10½	11	11½	12	12½	13	13½
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
4	920	1040	1150	1210	1270	1330	1380	1440	1500	1560
4½	1040	1170	1300	1360	1430	1490	1560	1620	1690	1750
5	1150	1300	1440	1510	1590	1660	1730	1800	1870	1950
5½	1270	1430	1590	1670	1740	1820	1900	1980	2060	2140
6	1380	1560	1730	1820	1900	1990	2080	2160	2250	2340
6½	1500	1690	1870	1970	2060	2160	2250	2340	2440	2530
7	1610	1820	2020	2120	2220	2320	2420	2520	2620	2720
7½	1730	1950	2160	2270	2380	2490	2600	2700	2810	2920
8	1850	2080	2310	2420	2540	2650	2770	2880	3000	3110
8½	1960	2210	2450	2570	2700	2820	2940	3060	3190	3310
9	2080	2340	2600	2730	2850	2980	3110	3240	3370	3500

10 per cent. allowed for stoppages.
Revolutions per minute of beater, 1,500.

Kitson Picking Machinery, Continued.

Production Table for Lappers.

(Concluded.)

(in lbs. per day of 10 hours.)

Diameter of Feed Pulley, in inches.	Weight of Lap in Ounces per Yard.								
	14	14½	15	15½	16	16½	17	17½	18
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
4	1610	1670	1730	1790	1850	1900	1960	2020	2080
4½	1820	1880	1950	2010	2080	2140	2210	2270	2340
5	2020	2090	2160	2240	2310	2380	2450	2520	2600
5½	2220	2300	2380	2460	2540	2620	2700	2780	2850
6	2420	2510	2600	2680	2770	2850	2940	3030	3110
6½	2620	2720	2810	2910	3000	3090	3190	3280	3370
7	2830	2930	3030	3130	3230	3330	3430	3530	3630
7½	3030	3140	3240	3350	3460	3570	3680	3790	3890
8	3230	3340	3460	3580	3690	3810	3920	4040	4150
8½	3430	3550	3680	3800	3920	4040	4170	4290	4410
9	3630	3760	3900	4020	4150	4280	4410	4540	4670

10 per cent. allowed for stoppages.
Revolutions per minute of beater, 1500.

DATA REQUIRED FOR BUILDING PICKING MACHINERY.

(1). State number of each type of machine required, and how divided into "sets."

(2). Are the Automatic Feeders to be attached to the Breakers direct, or to the Openers: and are they to have Eveners?

(3). Is the Cleaning Trunk to be Perham's Inclined Trunk, Robinson's Automatic Horizontal Trunk, or plain Cleaning Trunk, stating number of feet desired of each.

(4). State whether the machine builder is to furnish Plain Conducting Trunk required.

(5). State also whether he is to furnish the Dust Pipes required.

(6). Width of Laps to be used.

(7). Weight of Laps in ounces per running yard.

(8). Are Kirschner Carding Beaters desired on the Finisher Lappers?

(9). State the production desired from each machine in pounds per day of ten hours.

(10). Shipping instructions; state date of shipment and routing desired.

(11). When possible, also send sketches giving floor plans of opener and lapper rooms and vertical section through the same, so the Connecting and Cleaning Trunks and Dust Piping can be laid out and arranged for.

(12). If Blower System is desired for conveying the cotton from the warehouse to the Lapper Opening Room, state—

> (a). Number of pounds of cotton to be handled in 10 hours.
>
> (b). For large outputs it is desirable to have Automatic Feeders in the warehouse opening room; state whether power is available to drive them.
>
> (c). State whether maker is to furnish galvanized piping or whether purchaser will do so.
>
> (d). Send sketch showing relative location of warehouses and lapper rooms.

(13). State in detail what Waste Machinery is desired in the way of Thread Extractors, Waste Pickers, etc.

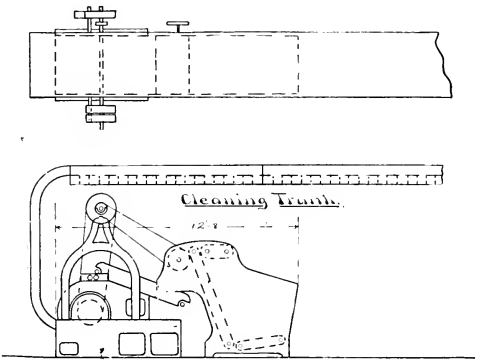
Kitson Picking Machinery, Continued.

Floor Spaces.

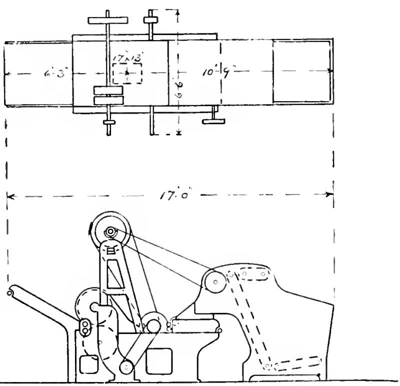
The following cuts give the floor spaces occupied by the various classes of picking machinery, with the exception of the Cop Waste Breaking Up Machine, which is exactly like the No. 3 Roving Waste Opener in every respect, except that it is built five sections long, fitted with two countershafts, and is 37'-7½" long over all.

NOTE :—For sizes and speeds of pulleys see page 29.

Kitson Picking Machinery, Continued.

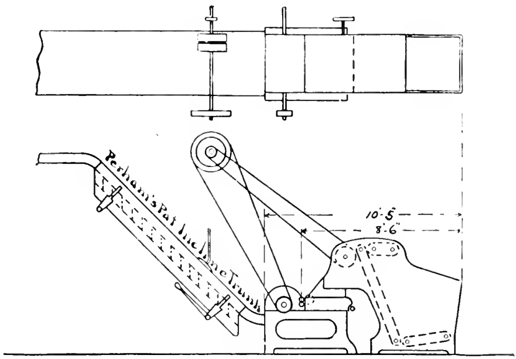


Cylinder Opener with Feeder attached

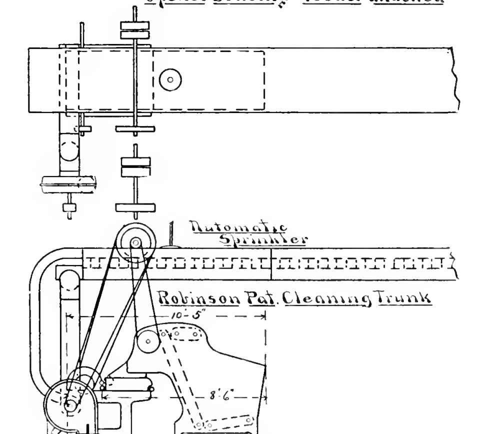


One Section Opener with Apron Delivery

Kitson Picking Machinery, Continued.

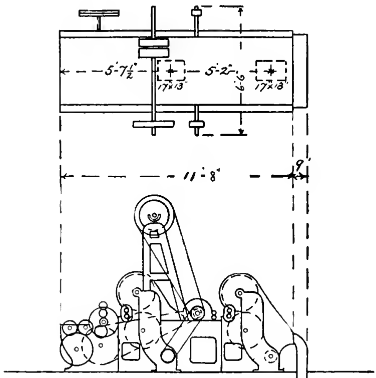


Opener Bottom with Feeder attached

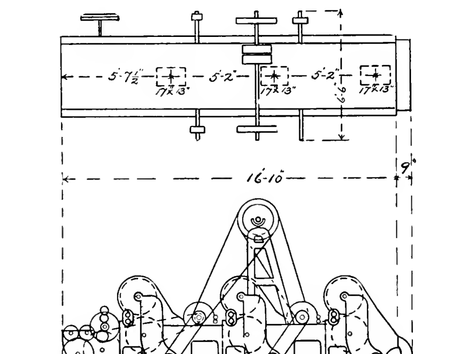


O-7. Opener with Feeder attached

Kitson Picking Machinery, Continued.

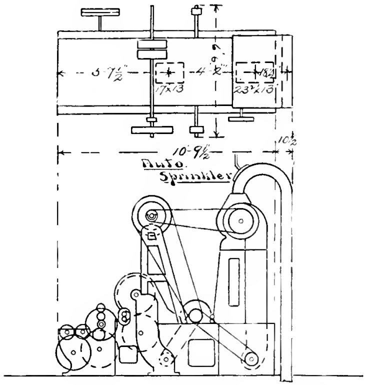


One Section Breaker with Screen Section

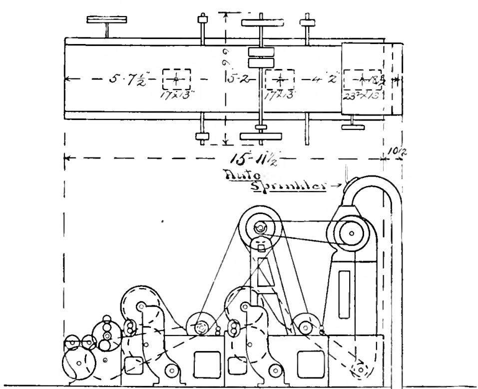


Two Section Breaker with Screen Section

Kitson Picking Machinery, Continued.

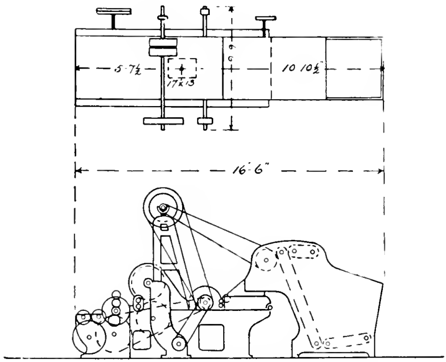


One Section Breaker with Condenser & Gauge Box

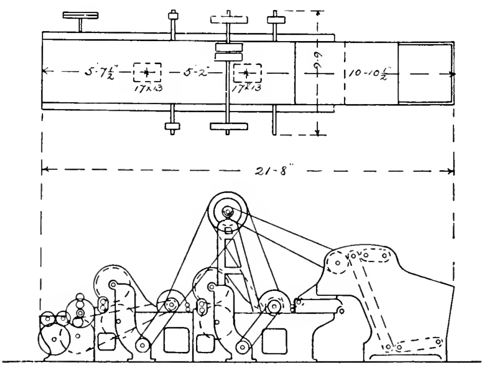


Two Section Breaker with Condenser & Gauge Box.

Kitson Picking Machinery, Continued.

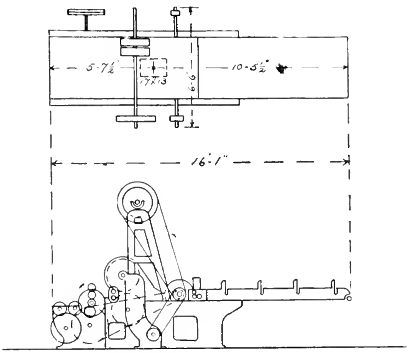


One Section Breaker with Feeder attached

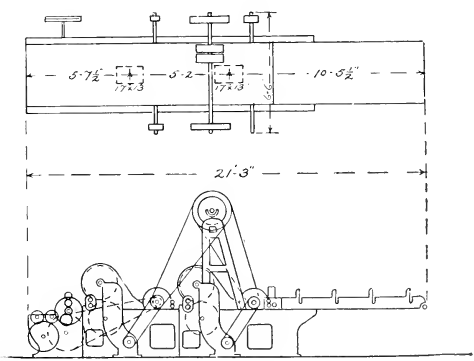


Two Section Breaker with Feeder attached

Kitson Picking Machinery, Continued.

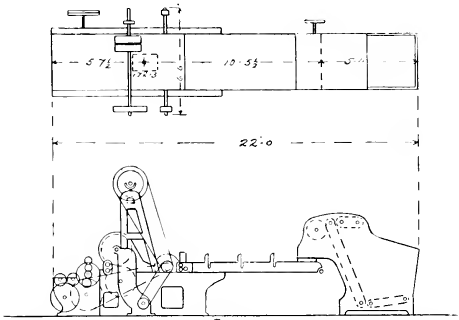


One Section Finisher

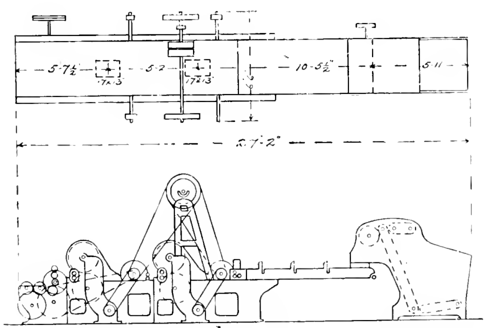


Two Section Finisher.

Kitson Picking Machinery, Continued.

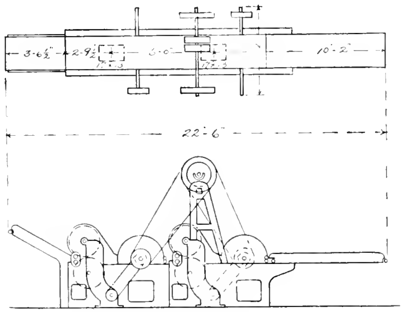


One Section Finisher with Feeder. Combination Brkr & Fin

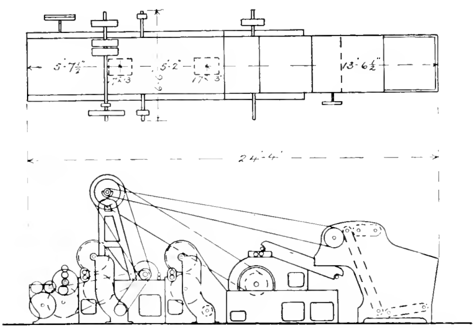


Two Section Finisher with Feeder. Combination Brkr & Fin.

Kitson Picking Machinery, Continued.



W-3. Waste Opener



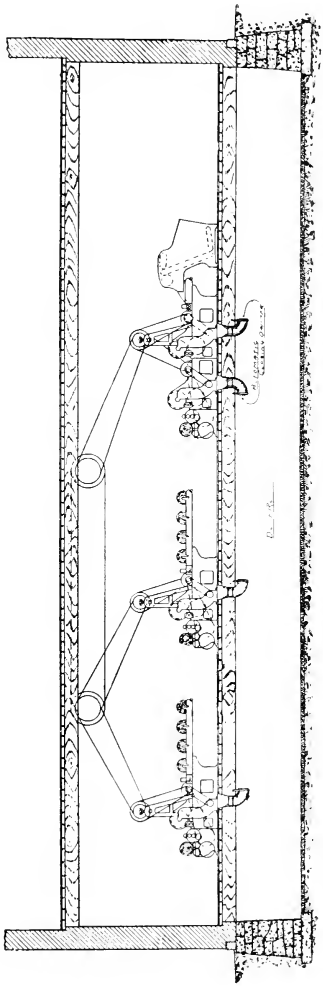
Two Section Breaker, w/ Feeder attached. 1st Sec Cyl Opener

Kitson Picking Machinery, Continued.

SAMPLE ARRANGEMENTS OF PICKER ROOMS.

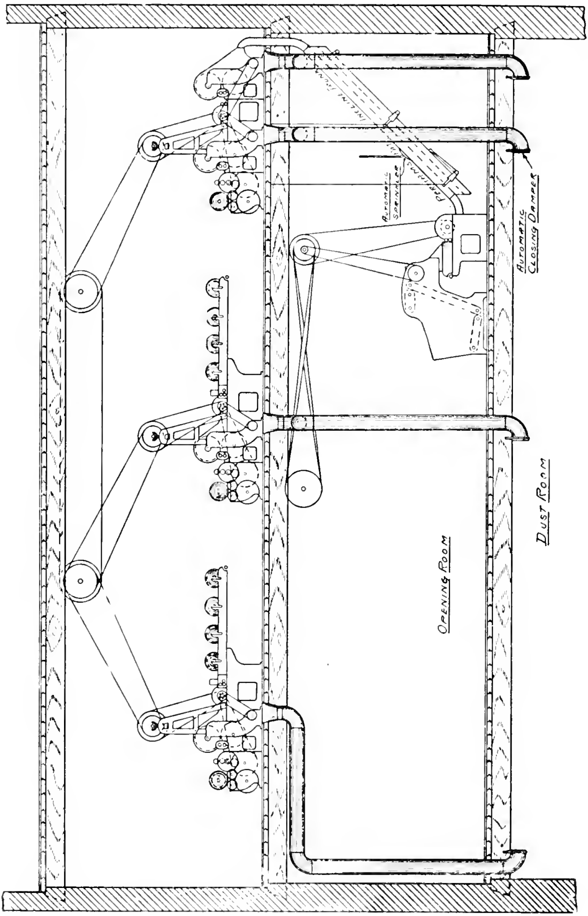
The cuts on the three following pages are sufficiently explanatory in themselves. With these for a guide, the proper arrangement of the different machines best adapted to any particular condition will readily suggest itself.

Kitson Picking Machinery, Continued.



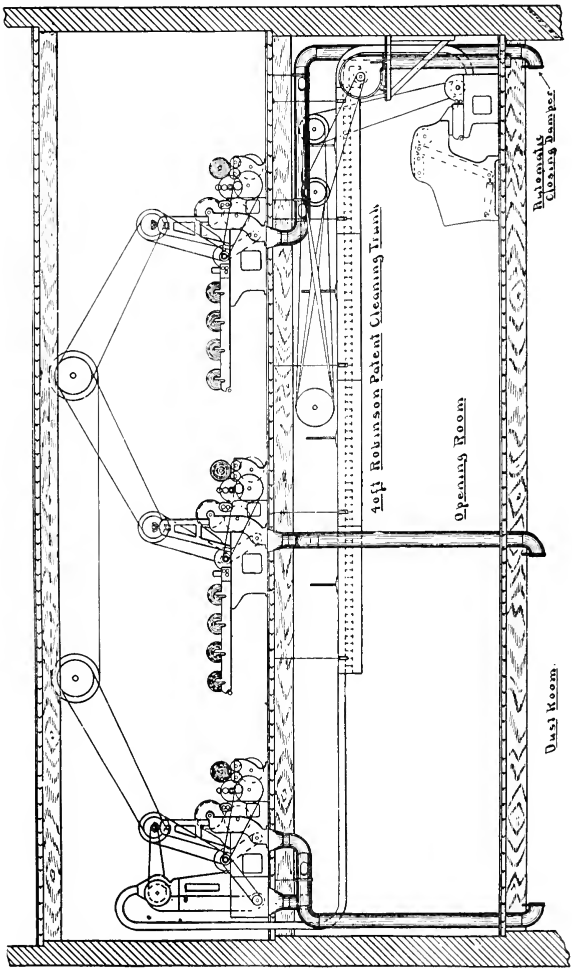
Arrangement No. 1.—This shows a three process system of four beaters, the Feeder being directly attached to the Breaker lapper, doing away with cleaning trunk. It produces well cleaned and even work and being a compact plant adapts itself to a one story picker room. The above system with one section removed from the Breaker Lapper making a three process system of one beater machines, is used for long staple cottons, the machines being fitted with adjustable beater boxes and cut-offs.

Kitson Picking Machinery, Continued.



Arrangement No. 2.—This shows a three process system of four beaters but with the Breaker Lapper separated, using the O. 7. Opener and Feeder part down stairs, and connecting same by Perham's Patent Inclined Cleaning Trunk to Screen Section Breaker up stairs.

Kitson Picking Machinery, Concluded.

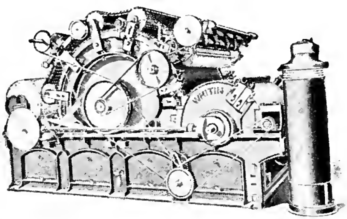


Arrangement No. 3.—This is adapted to a mill of two or more stories, for handling the dirtiest of cotton. The long line of Patent Cleaning Trunk cleans it very effectively: the breaker lapper is fitted with a condenser and gauge box section.

REVOLVING FLAT CARD,

Manufactured by

The Whitin Machine Works.



This machine is of the latest improved type. The cylinder is 50″ diameter, either 40″ or 45″ wide, as purchaser may desire, and is run in bushings placed in pedestal boxes. These bushings can be renewed when worn without requiring a new box. The card is heavily proportioned, well ribbed and stiff. The cylinder is ground perfectly true and balanced to double the speed required. The flats are not subjected to a straightening process but are ground to an even smooth surface.

The grinding device for the flats is such that the flats are supported on the same surface and in the same plane when being ground as they are while actually carding: consequently the original pitch is maintained with perfect accuracy, and when the flats are all in position on the flexible bend, all can be set by the same gauge to the cylinder. The setting is accomplished by the well known flexible bend resting on three setting points with two intermediate pushing points, so it is adjustable at five points on each side.

Whitin Carding Machinery, Continued.

A few improvements peculiar to our Card, are :

Adjustable under screens with extra heavy knife blades, stands and attachments ; all arranged so that the first setting of the screens is maintained always ; that is, the first setting of the screen at the junction of the licker-in and cylinder is maintained, and is governed wholly by the setting of the licker-in.

The knife blades under licker-in, which are used for removing motes, have an independent adjustment whereby they can be placed in varying positions to get more or less waste, the latitude of these variations being very great. When finally set in place they move with the licker-in and screens.

Arrangement of licker-in roll boxes and shields, whereby the setting of the licker-in controls the position of the screens underneath. This does away with the trouble of cotton getting into the ends of the licker-in and causing heat and annoyance.

Attention is also called to our patented device for keeping the tops of the revolving flats clear from lint, etc. A detailed description of this will be found on page 50.

Patent wire braced screens whereby we obtain maximum stiffness, leaving also maximum space for dirt to fall through. We also do away with the liability of the brace becoming loose and damaging the clothing because the brace passes through the bars and cannot possibly become detached. The calender rolls are brought close to the doffer, and the card sliver passing from doffer comb to calender roll is carried at a considerable distance below the comb shaft, thereby doing away with the liability of sliver breaking or catching on the comb shaft.

Gears are also provided to change the speed of calender rolls to fast or slow, and also speed of coiler to allow for varying conditions of weather, etc.

A draw box containing a set of $1\frac{1}{8}''$ diameter fluted rolls (two bottom and two top rolls) may be applied, if desired, instead of the usual $3\frac{9}{10}''$ diameter smooth calender rolls.

A patented slow motion is provided to run the doffer at reduced speed at will. The main advantage is seen in piecing up an end, when by simply moving the shipper handle in the reverse direction from the one that is used to run the doffer, the speed is reduced by bringing into play an extra set of gears, causing the doffer to revolve at about five revolutions per minute. It is then an extremely easy matter to gather up the ends and pass the sliver through to the coiler can with

Whitin Carding Machinery, Continued.

a minimum waste. A return of the shipper handle to the regular position for running starts the doffer at full speed and the card into full work. This slow motion need not be used unless desired; it is simply present when wanted. It has no effect on the running of the card in any other way.

Patent scrapers to clean front carriers that determine the position of the flats when they leave the card cylinder. These scrapers keep the carriers thoroughly clean, insuring that the top flats will always remain in a definite position.

Position of revolving brush on top flats is such that we are enabled at all times to readily clean any lint and waste that may collect between the flats, and to ascertain that the tops set properly on the carriers.

Fixed brushes over the licker-in to clean the ends of the tops just before they are introduced to the cylinder.

Oil drip cups under cylinder and licker-in boxes, which catch the refuse oil and are readily removed and emptied; thus saving quite a little in oil and also insuring a neat appearance of the card.

The improved comb box is made large and strong, particular attention being given to getting the working parts accurate and close running and in perfect alignment. We have also provided large and efficient ducts for the return of the oil, so that none will escape to the outside of the box. We also furnish double step pulleys which allow the comb to be run at different speeds by simply changing the band from one to the other.

We use the Ashworth clip for fastening clothing to the top flats, which we consider is the best fastener on the market. It renders the flat stronger and does away with the drilling, and the selvage edges of top flat clothing. It is also secure, and we are able to get any stretch required with surety, which is not the case in many of the imitations.

In short, the highest results obtainable from machines of this type are guaranteed.

Our 40″ Revolving Flat Cards are made with both 24″ doffers and 104 flats, and with 27″ doffers and 110 flats, as the customer may prefer: our 45″ Card is made with 27″ doffer and 110 flats.

Whitin Carding Machinery, Continued.

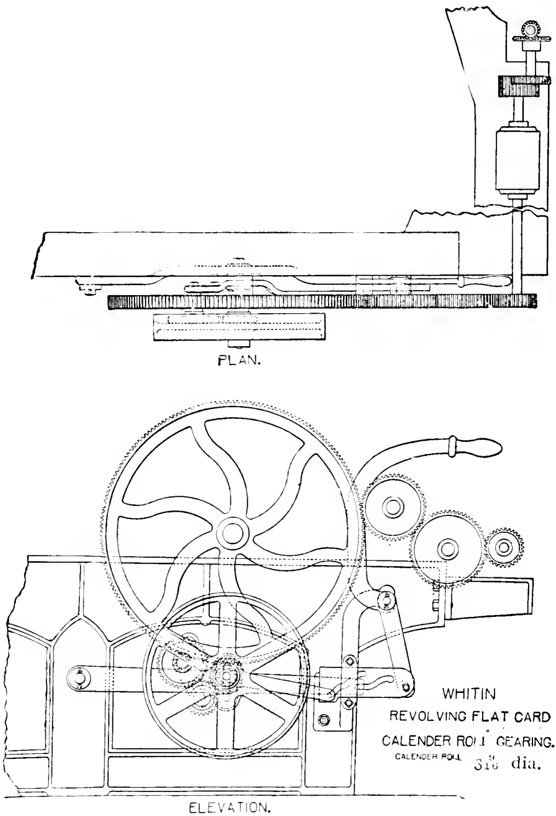
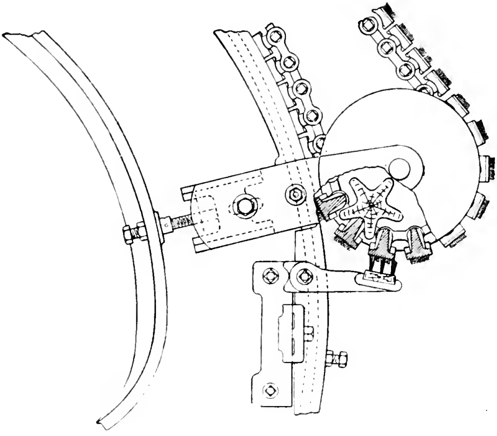


Diagram of Revolving Flat Card, showing Calender Roll Gearing and Doffer Slow Motion.

Whitin Carding Machinery, Continued.



Revolving Flat Clearing Device.

The above cut shows our patent device for keeping the tops of the revolving flats clear from lint, etc. It consists of a wooden roller, a section of which is in the shape of a five-pointed star, about the length of the flat. This roller is covered with felt and is placed loosely in position as indicated by the cut. The motion of the flats revolves this slowly, collecting the lint on the felt. It can readily be removed any time to take off the accumulation of lint, etc.

Just below the section of this roller there will also be seen a small brush for keeping the bearing ends of the flats clean.

Whitin Carding Machinery, Continued.

Improved Grinding Device for Revolving Flats of Carding Engine.

We consider the grinding device herewith shown the simplest and most reliable in use for perfect grinding of the top flats. The grinding surface, in distinction to the carding surface, of the flats, is done away with, both operations being performed from the same face. Under the old system of carding from one surface and grinding from another, both faces of the flat became worn, and the original form was finally destroyed, thus making it impossible to set the flats accurately enough for the best results. The device we apply removes this objection, as there is only one surface subjected to wear. The flats are supported on the same face and in the same place when grinding as when carding, consequently the original pitch is maintained, and the flats in position on the flexible bend can all be set by the same gauge to the cylinder.

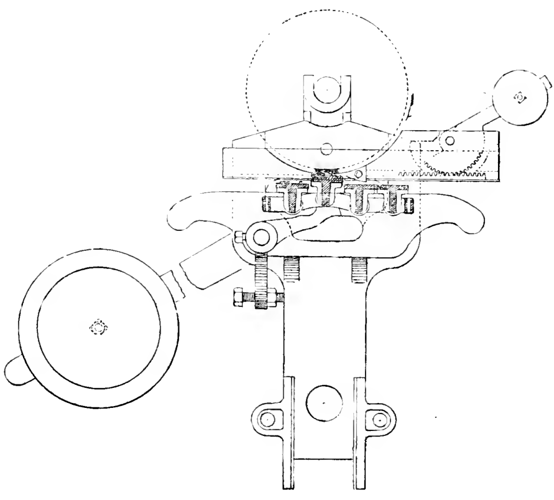
The device will be easily understood by reference to Fig. 1. At the top will be seen the bridge bracket in which a rack and bar slide. To this bar is attached a shoe or pin (shown across the end of the raised flat) the lower surface of which is milled to the particular bevel at which it is desired to grind the flat. The position of the carding surfaces of the flats when grinding is regulated by the shoe or pin, and the action of the lifter (shown as supporting the raised flat) with its levers, one of which is loaded by the large weight at the left. Each flat as it travels along seizes the lip of the shoe, and is carried along until the clothed surface has passed under the grinding roller. The flat then drops off the

Whitin Carding Machinery, Continued.

lifter, and releases the shoe, which is immediately returned to its original position by the positive movement of the rack quadrant and small weight at the right. It will be seen that each flat is treated alike, ensuring uniformity in grinding that cannot be surpassed.

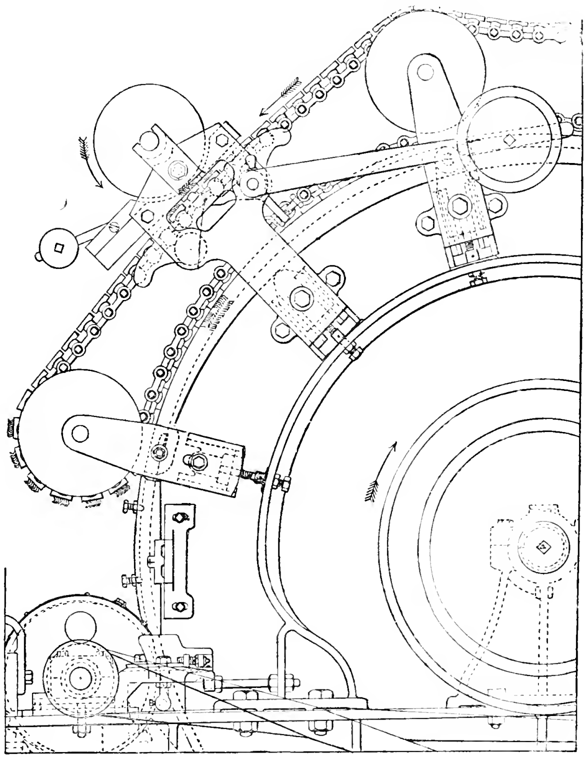
Fig 2 shows the device in position on the card. It may be placed at the back or front, the former position being generally preferred on account of convenience in setting the grinding roller.

Fig. 1.



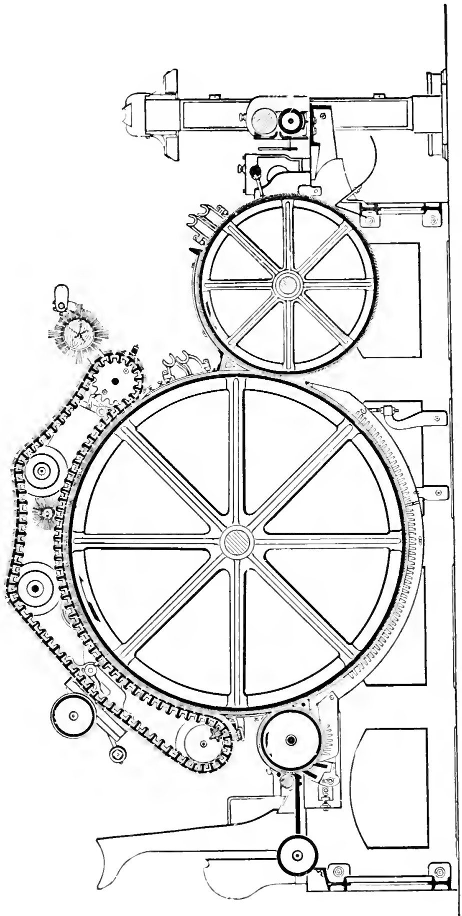
Whitin Carding Machinery, Continued.

Fig. 2



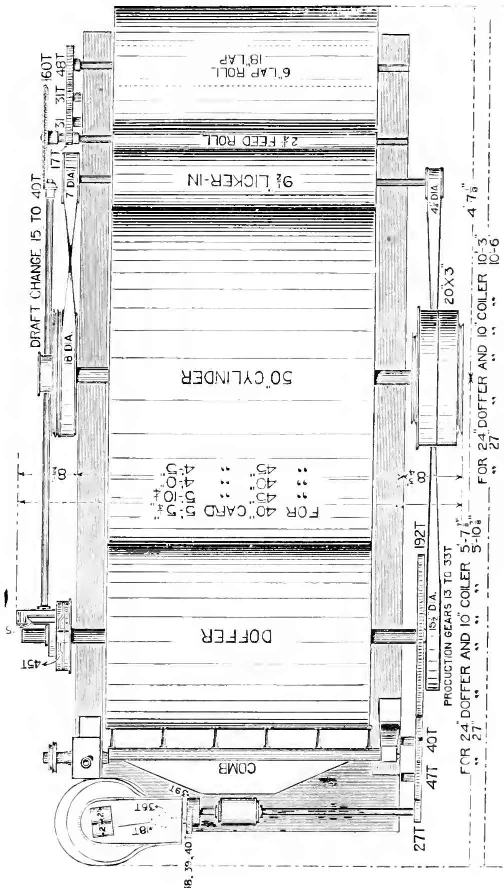
Improved Grinding Device.

Whitin Carding Machinery, Continued.



Section of Revolving Flat Card with 27 in. Doffer and 110 Top Flats.

Whitin Carding Machinery, Continued.



PLAN OF REVOLVING FLAT CARD.

Whitin Carding Machinery, Continued.

Extras Required.

Stripping Roll, for brushing out cylinder and doffer.
Burnishing Roll for burnishing clothing.
Long Roll Grinder for grinding flats.
Two Traverse Grinders for grinding cylinder and doffer.
See page 66 for **Methods of Grinding and Stripping.**

General Specifications for 40″ Card with 24″ doffer are as follows:

Cylinder 50″ diameter, 40″ wide.
Doffer 24″ diameter, 40″ wide.
Licker-in 9½″ diameter, 40″ wide.
Driving Pulleys 20″ diameter, 3″ face.

Clothing, either best English or American clothing of any make preferred. For cylinder 50″ diameter, carding surface 40″ wide, about 44 square feet, or 268 running feet, 2″ wide.

Doffer 24″ diameter, carding surface 40″ wide, about 21 square feet of clothing, or 172 running feet, 1½″ wide.

Flats:—There are 104 top flats, 1⅜″ wide, 39 of which are working; they are 40″ long by ⅞″ width of points, about 25⅓ square feet of clothing.

Belting:—For doffer, 14′-2″ of 2″ belt; for licker-in, 9′ of 2″ belt: for top flats, 6′ of 1½″ belt: for comb (two belts), 8′-9″ and 7′-9″ of round belt, ⅜″ diameter; for brush, 5′-1″ of round belt, ⅜″ diameter.

No allowance in above for lapping.

Floor space:—Outside 18″ lap and 10″ coiler, 10′-3″ by 5′-5¼″ over all.

Coilers are furnished for 10″, 11″, or 12″ cans, as desired.

General Specifications for 40″ Card with 27″ doffer, are as follows:

Cylinder 50″ diameter, 40″ wide.
Doffer 27″ diameter, 40″ wide.
Licker-in 9½″ diameter, 40″ wide.
Driving Pulleys 20″ diameter, 3″ face.

Clothing, either the best English or American clothing of any make preferred. For cylinder 50″ diameter, carding surface 40″ wide, about 44 square feet, or 268 running feet, 2″ wide.

Whitin Carding Machinery, Continued.

Doffer 27″ diameter, carding surface 40″ wide, about 27 square feet clothing, or 194 running feet, 1½″ wide.

Flats:—There are 110 top flats, 1⅜″ wide, 44 of which are working; they are 40″ long by ⅞″ width of points, about 27 square feet of clothing.

Belting:—For doffer, 14′-6″ of 2″ belt; for licker-in, 9′ of 2″ belt: for top flats, 6′ of 1½″ belt; for comb (two belts), 8′-10″ and 8′ of round belt, ⅜″ diameter; for brush, 5′-1″ of round belt, ⅜″ diameter.

No allowance in above for lapping.

Floor space:—Outside 18″ lap and 10″ coiler, 10′-6″ by 5′-5¼″ over all.

Coilers are furnished for 10″, 11″, or 12″ cans, as desired.

General Specifications for 45″ Card with 27″ doffer, as follows:

Cylinder 50″ diameter, 45″ wide.
Doffer 27″ diameter, 45″ wide.
Licker-in 9½″ diameter, 45″ wide.
Driving Pulleys 20″ diameter, 3″ face.

Clothing, either the best English or American clothing of any make preferred. For cylinder 50″ diameter, carding surface 45″ wide, about 50 square feet or 297 running feet, 2″ wide.

Doffer 27″ diameter, carding surface 45″ wide, about 30 square feet clothing, or 218 running feet, 1½″ wide.

Flats:—There are 110 top flats, 1⅜″ wide, 44 of which are working; they are 45″ long by ⅞″ width of points, about 30¼ square feet clothing.

Belting:—For doffer, 14′-6″ of 2″ belt; for licker-in, 9′ of 2″ belt; for top flats, 6′ of 1½″ belt; for comb (two belts), 8′-10″ and 8′ of round belt, ⅜″ diameter; for brush, 5′-1″ of round belt, ⅜″ diameter.

No allowance in above for lapping.

Floor space:—Outside 18″ lap and 10″ coiler, 10′-6″ by 5′-10¼″ over all.

Coilers are furnished for 10″, 11″, or 12″ cans, as desired.

Whitin Carding Machinery, Continued.

Card Clothing.

English Counts.	Points per Square Foot.	American No. of Wire.
60's	43200	28
70's	50400	30
80's	57600	31
90's	64800	32
100's	72000	33
110's	79200	34
120's	86400	35
130's	93600	36

For Coarse Yarns use on { Cylinders, Nos. 90's and 100's. Doffers and Flats, Nos. 100's and 110's.

For Medium Yarns use on { Cylinders, Nos. 100's and 110's. Doffers and Flats, Nos. 110's and 120's.

Fillet for Cylinders and Doffers.

With 4 Crowns, or 24 Points per Inch.

Noggs per Inch.	Points per Square Foot.	American No. of Wire.
16	55296	31
17	58752	
18	62208	32
19	65664	
20	69120	33
21	72576	
22	76032	34
23	79488	
24	82944	35
25	86400	
26	89856	36

Sheets for Top Flats.

Points per Inch in Length.	Points per Inch in Width.					
	25	24	23	22	21	20
	Points per Sq. Ft.	Points per Sq. Ft.	Points per Sq. Ft.	Points per Sq. Ft.	Points per Sq. Ft.	Points per Sq. Ft.
25	90000	86400	82800	79200	75600	72000
24	86400	82944	79488	76032	72576	69120
23	82800	79488	76176	72864	69552	66240
22	79200	76032	72864	69696	66528	63360
21	75600	72576	69552	66528	63504	60480
20	72000	69120	66240	63360	60480	57600

Whitin Carding Machinery, Continued.

Table for Calculating the exact Lengths of Fillets required for Clothing various sizes of Cylinders, Doffers and Rollers of Whitin Cards.

Width in inches of Card on wire.	BREADTH OF FILLETS.									
	$\frac{1}{2}$ Inch.	$\frac{3}{4}$ Inch.	1 Inch.	$1\frac{1}{8}$ Inch.	$1\frac{1}{4}$ Inch.	$1\frac{5}{16}$ Inch.	$1\frac{1}{2}$ Inch.	$1\frac{5}{8}$ Inch.	$1\frac{3}{4}$ Inch.	2 Inch.
30	15.708	10.472	7.8540	6.9810	6.2832	5.9839	5.2360	4.8332	4.4880	3.9270
31	16.231	10.821	8.1158	7.2137	6.4927	6.1834	5.4106	4.9943	4.6376	4.0576
32	16.755	11.170	8.3776	7.4464	6.7021	6.3829	5.5851	5.1554	4.7872	4.1888
33	17.278	11.519	8.6394	7.6791	6.9115	6.5823	5.7596	5.3165	4.9368	4.3197
34	17.802	11.868	8.9012	7.9118	7.1209	6.7818	5.9342	5.4776	5.0864	4.4506
35	18.326	12.217	9.1630	8.1445	7.3304	6.9813	6.1088	5.6387	5.2360	4.5815
36	18.849	12.556	9.4248	8.3772	7.5398	7.1800	6.2832	5.7998	5.3856	4.7124
37	19.373	12.915	9.6866	8.6099	7.7492	7.3800	6.4578	5.9609	5.5352	4.8433
38	19.896	13.264	9.9484	8.8426	7.9587	7.5797	6.6323	6.1221	5.6848	4.9742
39	20.420	13.613	10.2102	9.0753	8.1681	7.7791	6.8068	6.2832	5.8344	5.1051
40	20.944	13.962	10.4720	9.3080	8.3776	7.9787	6.9814	6.4443	5.9840	5.2360
41	21.467	14.311	10.7338	9.5407	8.5870	8.1781	7.1558	6.6054	6.1336	5.3669
42	21.991	14.660	10.9956	9.7734	8.7964	8.3775	7.3304	6.7665	6.2832	5.4978
43	22.514	15.010	11.2574	10.0061	9.0059	8.5770	7.5050	6.9276	6.4328	5.6287
44	23.038	15.359	11.5192	10.2388	9.2153	8.7765	7.6795	7.0887	6.5824	5.7596
45	23.562	15.708	11.7810	10.4715	9.4248	8.9759	7.8540	7.2498	6.7320	5.8905
46	24.085	16.057	12.0428	10.7042	9.6342	9.1754	8.0286	7.4109	6.8816	6.0214
47	24.619	16.406	12.3046	10.9369	9.8436	9.3749	8.2031	7.5721	7.0312	6.1523
48	25.132	16.755	12.5664	11.1696	10.0530	9.5743	8.3776	7.7332	7.1808	6.2832

RULE: — Find on first column the width of card, and on top line the breadth of fillet with which the cylinders, etc., are to be covered. The figures under the breadth of fillet, and in same column opposite width of card, give the constant required; multiply diameter of cylinder, etc., by constant and the result gives the length in feet of the fillet necessary.

EXAMPLE: — Cylinder 40 inches on wire by 50 inches in diameter, to be covered with 2 inch fillet. Constant 5.236 x 50 is equal to 261.800, or 262 feet, the length required.

Whitin Carding Machinery, Continued.

Draught Table of Revolving Flat Card.

27 in. Doffer with $3\frac{9}{10}$ in. dia. Card Calender Rolls.

Diameter of { Lap Roll, 6 in.
Coiler Calender Rolls, 2 in. }

Lap Roll Gear 48 Teeth. Doffer Gear, 192 Teeth.

Feed Roll Gear, 17 Teeth. Feed Roll Bevel Gear 160 Teeth.

Card Calender Roll Shaft Gear, 25 Teeth.

Driver, Coiler Shaft Gear, 36 Teeth.

Coiler Shaft Gear, 18 Teeth.

Change Gears.	Compensating Gears.		
	38 Teeth.	39 Teeth.	40 Teeth.
	Draught.	Draught.	Draught.
15 Teeth.	158.26	154.20	150.35
16	148.36	144.56	140.95
17	139.65	136.06	132.66
18	131.87	128.50	125.29
19	124.94	121.74	118.69
20	118.69	115.65	112.76
21	113.04	110.14	107.39
22	107.91	105.14	102.51
23	103.22	100.57	98.06
24	98.92	96.38	93.97
25	94.96	92.52	90.21
26	91.30	88.96	86.74
27	87.92	85.67	83.53
28	84.78	82.61	80.54
29	81.86	79.76	77.77
30	79.13	77.10	75.17
31	76.57	74.61	72.74
32	74.18	72.29	70.48
33	71.93	70.09	68.34
34	69.82	68.04	66.33
35	67.82	66.09	64.43
36	65.94	64.25	62.64
37	64.16	62.51	60.95
38	62.47	60.87	59.35
39	60.87	59.31	57.83
40	59.35	57.83	56.38

Whitin Carding Machinery, Continued.

Draught Table of Revolving Flat Card.

24 in. Doffer with $3\frac{9}{10}$ in. dia. Card Calender Rolls.

Diameter of { Lap Roll, 6 in.
Coiler Calender Rolls, 2 in.

Lap Roll Gear 48 Teeth. Doffer Gear, 192 Teeth.

Feed Roll Gear, 17 Teeth. Feed Roll Bevel Gear 160 Teeth.

Card Calender Roll Shaft Gear, 27 Teeth.

Driver, Coiler Shaft Gear, 36 Teeth.

Coiler Shaft Gear, 18 Teeth.

Change Gears.	Compensating Gears.		
	38 Teeth.	39 Teeth.	40 Teeth.
	Draught.	Draught.	Draught.
15 Teeth.	146.54	142.78	139.21
16	137.38	133.86	130.51
17	129.30	125.98	122.83
18	122.11	118.98	116.00
19	115.68	112.72	109.90
20	109.90	107.09	104.41
21	104.67	101.99	99.44
22	99.91	97.35	94.92
23	95.57	93.12	90.79
24	91.59	89.24	87.01
25	87.92	85.67	83.53
26	84.54	82.37	80.31
27	81.41	79.32	77.33
28	78.50	76.49	74.58
29	75.79	73.85	72.00
30	73.27	71.39	69.60
31	70.91	69.09	67.36
32	68.69	66.93	65.25
33	66.63	64.90	63.28
34	64.66	62.99	61.42
35	62.80	61.19	59.66
36	61.06	59.49	58.01
37	59.41	57.88	56.44
38	57.84	56.36	54.95
39	56.36	54.90	53.54
40	54.95	53.54	52.20

Whitin Carding Machinery, Continued.

Revolving Flat Card.

Cylinder 165 rev. Cyl. Pul'y 18'' dia. Licker-in Driven 7'' dia. Licker-in Driver 4¼'' dia.		Table showing number pounds Card Sliver produced in one day of 10 hours. Doffer 27¾ in. Diameter outside of Clothing. Number of Grains in one yard of Sliver.										Side Pulley 15½'' dia. Doffer Gear 192 T.
Change Gear.	Rev. of Doffer per Minute.	38	40	42	44	46	48	50	52	54	56	Rev. of Doffer per Minute.
		LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	
13T	7.88	65.37	68.81	72.25	75.70	79.13	82.57	86.01	89.46	92.90	96.33	7.88
14	8.48	70.34	74.04	77.73	81.44	85.14	88.85	92.54	96.24	99.95	103.65	8.48
15	9.09	75.41	79.37	83.35	87.31	91.28	95.25	99.22	103.18	107.15	111.12	9.09
16	9.70	80.48	84.71	88.95	93.18	97.42	101.64	105.88	110.12	114.35	118.59	9.70
17	10.30	85.44	89.93	94.43	98.92	103.43	107.92	112.42	116.91	121.40	125.91	10.30
18	10.91	90.50	95.27	100.03	104.79	109.55	114.31	119.08	123.84	128.60	133.36	10.91
19	11.52	95.57	100.59	105.62	110.66	115.68	120.71	125.74	130.77	135.81	140.83	11.52
20	12.12	100.54	105.83	111.12	116.41	121.70	127.00	132.28	137.58	142.87	148.16	12.12
21	12.73	105.60	111.15	116.71	122.27	127.83	133.38	138.94	144.50	150.05	155.61	12.73
22	13.34	110.64	116.48	122.30	128.12	133.94	139.77	145.59	151.51	157.24	163.06	13.34
23	13.94	115.64	121.73	127.81	133.90	139.98	146.07	152.15	158.25	164.33	170.42	13.94
24	14.55	120.69	127.04	133.39	139.75	146.09	152.44	158.80	165.15	171.52	177.85	14.55
25	15.15	125.68	132.29	138.91	145.52	152.13	158.74	165.36	171.97	178.59	185.20	15.15
26	15.76	130.74	137.62	144.50	151.38	158.26	165.14	172.02	178.90	185.79	192.66	15.76
27	16.37	135.80	142.94	150.09	157.23	164.38	171.52	178.66	185.82	192.96	200.11	16.37
28	16.97	140.78	148.18	155.59	163.01	170.41	177.82	185.23	192.64	200.05	207.45	16.97
29	17.58	145.83	153.51	161.17	168.85	176.53	184.20	191.87	199.56	207.23	214.90	17.58
30	18.18	150.81	158.74	166.68	174.62	182.56	190.49	198.43	206.36	214.30	222.24	18.18
31	18.79	155.88	164.08	172.28	180.49	188.69	196.89	205.09	213.30	221.51	229.70	18.79
32	19.40	160.94	169.40	177.87	186.34	194.81	203.28	211.75	220.21	228.70	237.16	19.40
33	20.00	165.91	176.85	183.37	192.10	200.83	209.57	218.30	227.03	235.77	244.49	20.00

NOTE: — In the above table 5 per cent. of the time is allowed for cleaning, stripping, etc.

Whitin Carding Machinery, Continued.

Revolving Flat Card.

Cylinder 165 rev. Cyl. Pul'y 18'' dia. Licker-in Driven 7'' dia. Licker-in Driver 4¼'' dia.		Table showing number pounds Card Sliver produced in one day of 10 hours. Doffer 27¾ in. Diameter outside of Clothing. Number of Grains in one yard of Sliver.										Side Pulley 15½'' dia. Doffer Gear 192 T.
Change Gear.	Rev. of Doffer per Minute.	58	60	62	64	66	68	70	72	74	76	Rev. of Doffer per Minute.
		LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	
13T	7.88	99.77	103.22	106.66	110.10	113.53	116.98	120.42	123.86	127.31	130.74	7.88
14	8.48	107.36	111.05	114.75	118.46	122.16	125.87	129.56	133.26	136.97	140.67	8.48
15	9.09	115.09	119.06	123.03	127.00	130.97	134.93	138.91	142.87	146.84	150.81	9.09
16	9.70	122.82	127.06	131.30	135.53	139.77	144.00	148.24	152.48	156.71	160.95	9.70
17	10.30	130.40	134.90	139.39	143.89	148.39	152.89	157.38	161.88	166.37	170.88	10.30
18	10.91	138.12	142.89	147.65	152.41	157.17	161.93	166.70	171.46	176.22	180.98	10.91
19	11.52	145.86	150.90	155.92	160.96	165.98	171.00	176.05	181.07	186.11	191.13	11.52
20	12.12	153.45	158.74	164.04	169.33	174.62	179.91	185.20	190.49	195.77	201.08	12.12
21	12.73	161.17	166.73	172.28	177.84	183.40	188.95	194.51	200.07	205.63	211.18	12.73
22	13.34	168.89	174.71	180.53	186.35	192.18	198.00	203.82	209.64	215.47	221.26	13.34
23	13.94	176.50	182.58	188.67	194.77	200.84	206.03	213.02	219.11	225.20	231.27	13.94
24	14.55	184.20	190.56	196.91	203.27	209.61	215.96	222.32	228.67	235.03	241.36	14.55
25	15.15	191.82	198.43	205.05	211.66	218.28	224.89	231.51	238.11	244.74	251.34	15.15
26	15.76	199.55	206.43	213.31	220.19	227.07	233.95	240.84	247.71	254.60	261.47	15.76
27	16.37	207.25	214.40	221.55	228.70	235.85	242.99	250.14	257.29	264.43	271.58	16.37
28	16.97	214.87	222.27	229.68	237.10	244.50	251.91	259.33	266.73	274.14	281.54	16.97
29	17.58	222.58	230.26	237.93	245.60	253.28	260.95	268.62	276.31	283.98	291.65	17.58
30	18.18	230.18	238.12	246.05	253.99	261.93	269.86	277.80	285.74	293.68	301.61	18.18
31	18.79	237.92	246.12	254.32	262.53	270.73	278.93	287.13	295.34	303.54	311.74	18.79
32	19.40	245.63	254.10	262.57	271.04	279.51	287.97	296.44	304.91	313.39	321.86	19.40
33	20.00	253.23	261.96	270.69	279.43	288.15	296.88	305.62	314.35	323.09	331.81	20.00

NOTE:—In the above table 5 per cent. of the time is allowed for cleaning, stripping, etc.

Whitin Carding Machinery, Continued.

Revolving Flat Card.

Cylinder 165 rev. Cyl. Pul'y 18'' dia. Licker-in Driven 7'' dia. Licker-in Driver $4\frac{1}{4}$'' dia.		Table showing number pounds Card Sliver produced in one day of 10 hours. Doffer $24\frac{3}{4}$ in. Diameter outside of Clothing. Number of Grains in one yard of Sliver.										Side Pulleys $15\frac{1}{2}$'' dia. Doffer Gear 192 T.
Change Gear.	Rev. of Doffer per Minute.	38	40	42	44	46	48	50	52	54	56	Rev. of Doffer per Minute.
		LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	
13T	7.88	60.74	63.94	67.14	70.33	73.53	76.73	79.93	83.12	86.32	89.52	7.88
14	8.48	65.11	68.54	71.97	75.39	78.82	82.25	85.68	89.10	92.53	95.96	8.48
15	9.09	69.92	73.60	77.28	80.96	84.64	88.32	92.00	95.68	99.36	103.04	9.09
16	9.70	74.73	78.66	82.59	86.53	90.46	94.39	98.33	102.26	106.19	110.12	9.70
17	10.30	79.10	83.26	87.42	91.59	95.75	99.91	104.08	108.24	112.40	116.56	10.30
18	10.91	83.90	88.32	92.74	97.15	101.57	105.98	110.40	114.82	119.23	123.15	10.91
19	11.52	88.71	93.38	98.05	102.72	107.39	112.06	116.73	121.39	126.06	130.73	11.52
20	12.12	93.52	98.44	103.36	108.28	113.21	118.13	123.05	127.97	132.89	137.82	12.12
21	12.73	97.89	103.04	108.19	113.34	118.50	123.65	128.80	133.95	139.10	144.26	12.73
22	13.34	102.70	108.10	113.51	118.91	124.32	129.72	135.13	140.53	145.94	151.34	13.34
23	13.94	107.50	113.16	118.82	124.48	130.13	135.79	141.45	147.11	152.77	158.42	13.94
24	14.55	111.87	117.76	123.65	129.54	135.42	141.31	147.20	153.09	158.98	164.86	14.55
25	15.15	116.68	122.82	128.96	135.10	141.24	147.38	153.53	159.67	165.81	171.95	15.15
26	15.76	121.49	127.88	134.27	140.67	147.06	153.46	159.85	166.24	172.64	179.03	15.76
27	16.37	126.29	132.94	139.59	146.23	152.88	159.53	166.18	173.40	179.47	186.12	16.37
28	16.97	130.66	137.54	144.42	151.29	158.17	165.05	171.93	178.80	185.68	192.56	16.97
29	17.58	135.47	142.94	149.73	156.86	163.99	171.12	178.25	185.38	192.51	199.64	17.58
30	18.18	139.84	147.20	154.56	161.92	169.28	176.64	184.00	191.36	198.72	206.08	18.18
31	18.79	144.65	152.26	159.87	167.49	175.10	182.71	190.33	197.94	205.55	213.16	18.79
32	19.40	149.45	157.32	165.19	173.05	180.92	188.78	196.65	204.52	212.38	220.25	19.40
33	20.00	153.82	161.92	170.02	178.11	186.21	194.30	202.40	210.50	218.59	226.70	20.00

NOTE: — In the above table 5 per cent. of the time is allowed for cleaning, stripping, etc.

Whitin Carding Machinery, Continued.

Revolving Flat Card.

Cylinder 165 rev. Cyl. Pul'y 18'' dia. Licker-in Driven 7'' dia. Licker-in Driver 4¼'' dia.

Table showing number pounds Card Sliver produced in one day of 10 hours.

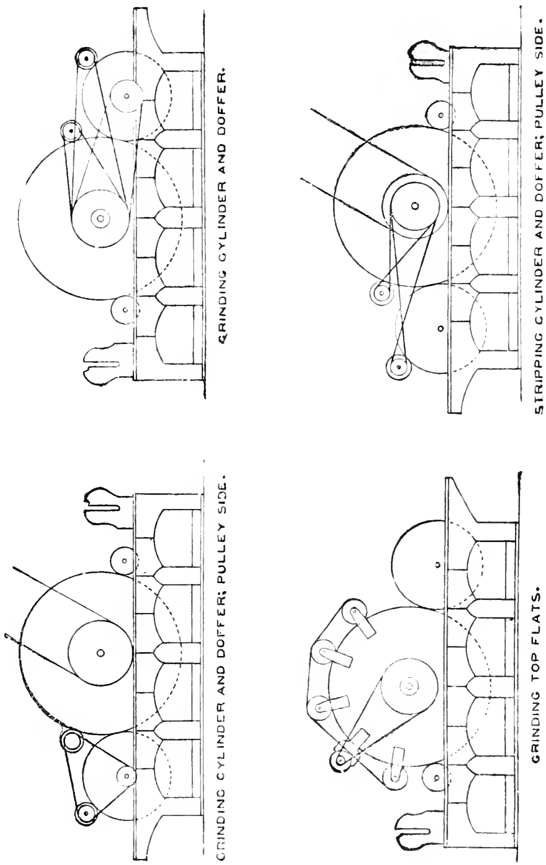
Doffer 24¾ in. Diameter outside of Clothing.

Side Pulley 15½'' dia. Doffer Gear 192 T.

Change Gear.	Rev. of Doffer per Minute.	58 LBS.	60 LBS.	62 LBS.	64 LBS.	66 LBS.	68 LBS.	70 LBS.	72 LBS.	74 LBS.	76 LBS.	Rev. of Doffer per Minute.
		Number of Grains in one yard of Sliver.										
13T	7.88	92.71	95.91	99.11	102.30	105.71	108.70	111.90	115.09	118.29	121.49	7.88
14	8.48	99.38	102.81	106.24	109.66	113.09	116.52	119.95	123.37	126.80	130.23	8.48
15	9.09	106.72	110.40	114.08	117.76	121.44	125.12	128.80	132.48	136.16	139.84	9.09
16	9.70	114.05	117.99	121.92	125.86	129.79	133.72	137.66	141.59	145.52	149.45	9.70
17	10.30	120.73	124.89	129.05	133.22	137.38	141.54	145.71	149.87	154.03	158.19	10.30
18	10.91	128.06	132.48	136.90	141.31	145.73	150.14	154.56	158.98	163.39	167.81	10.91
19	11.52	135.40	140.07	144.74	149.41	154.08	158.75	163.42	168.08	172.75	177.42	11.52
20	12.12	142.74	147.66	152.58	157.50	162.43	167.35	172.27	177.19	182.11	187.04	12.12
21	12.73	149.41	154.56	159.71	164.86	170.02	175.17	180.32	185.47	190.62	195.78	12.73
22	13.34	156.75	162.15	167.56	172.96	178.37	183.77	189.18	194.58	199.99	205.39	13.34
23	13.94	164.08	169.74	175.40	181.06	186.71	192.37	198.03	203.69	209.35	215.00	13.94
24	14.55	170.75	176.64	182.53	188.42	194.30	200.19	206.08	211.97	217.86	223.74	14.55
25	15.15	178.09	184.23	190.37	196.51	202.65	208.79	214.94	221.08	227.22	233.36	15.15
26	15.76	185.43	191.82	198.21	204.61	211.42	217.40	223.79	230.18	236.58	242.97	15.76
27	16.37	192.76	199.41	206.06	212.70	219.35	226.00	232.65	239.29	245.94	252.59	16.37
28	16.97	199.43	206.31	213.19	220.06	226.94	233.82	240.70	247.57	254.45	261.33	16.97
29	17.58	206.77	213.90	221.03	228.16	235.29	242.42	249.55	256.68	263.81	270.94	17.58
30	18.18	213.44	220.80	228.16	235.52	242.88	250.24	257.60	264.96	272.32	279.68	18.18
31	18.79	220.78	228.39	236.00	243.62	251.23	258.84	266.46	274.07	281.68	289.29	18.79
32	19.40	228.11	235.98	243.85	251.71	259.58	267.44	275.31	283.18	291.04	298.91	19.40
33	20.00	234.78	242.88	250.98	259.07	267.17	275.26	283.36	291.46	299.55	307.65	20.00

NOTE: — In the above table 5 per cent. of the time is allowed for cleaning, stripping, etc.

Whitin Carding Machinery, Concluded.

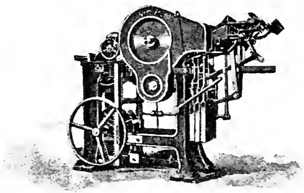


Methods of Grinding and Stripping.

COMBING MACHINERY,

Manufactured by

The Whitin Machine Works.



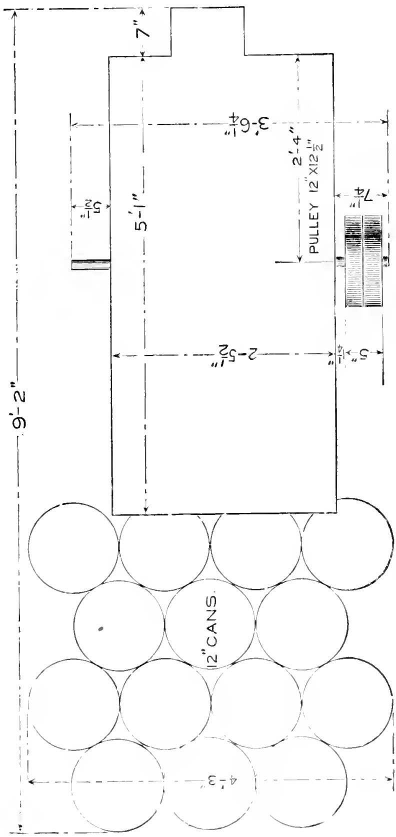
Sliver Lap Machine.

This machine is used to make laps for use on Combers or Ribbon Lap Machines. The Lap is formed by running from 12 to 16 Card or Drawing Frame slivers, placed in ordinary cans behind the machine, through guides and stop motion spoons to a drawhead consisting of three top and bottom rolls arranged with a slight draught. From these rolls the cotton is condensed by passing through two pairs of heavy calender rolls, and is then wound into a lap either $7\frac{1}{2}''$ or $8\frac{3}{4}''$ wide. When the laps are taken direct to the Comber they should be $8\frac{3}{4}''$ wide, but when made for a Ribbon Lap Machine they should be $1\frac{1}{4}''$ narrower to allow for spread in drawing. As it is essential that the laps made on this machine be of a perfectly uniform nature, a back stop motion is provided for each sliver, which causes the machine to stop instantly on the breaking of an end. Another stop motion is used which stops the machine when the lap reaches its full diameter, thus insuring the laps to be of a uniform length.

Pulleys:—12″ diameter by $2\frac{1}{2}''$ face, 120 revolutions per minute.

Floor Space:—Including cans, 9′ 2″ by 4′-3″.

Whitin Combing Machinery, Continued.



Sliver Lap Machine, Floor Plan.

Whitin Combing Machinery, Continued.

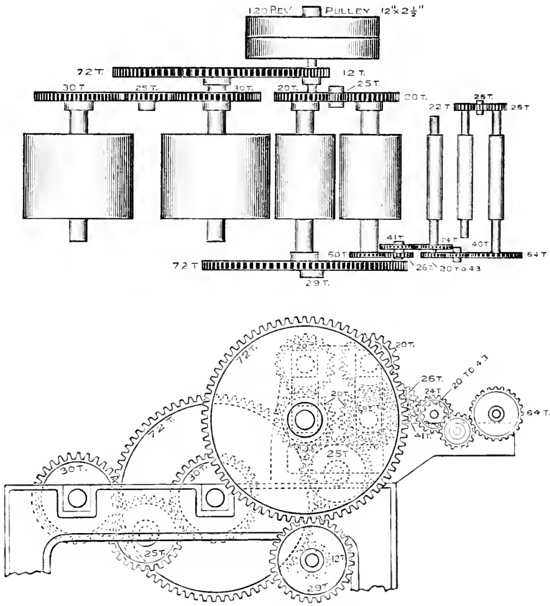


Diagram of Gearing.

Draught Table, Sliver Lap Machine.

Table gives total draught in machine.

Front Roll Change Gear.	Draught.	Front Roll Change Gear.	Draught.	Front Roll Change Gear.	Draught.
20	3.22	28	2.30	36	1.79
21	3.07	29	2.22	37	1.74
22	2.93	30	2.15	38	1.70
23	2.80	31	2.08	39	1.65
24	2.68	32	2.01	40	1.61
25	2.58	33	1.95	41	1.57
26	2.48	34	1.89	42	1.53
27	2.39	3[illegible]	1.8[illegible]	4[illegible]	1.50

Whitin Combing Machinery, Continued.

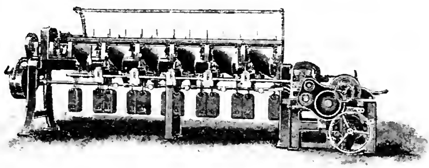
Sliver Lap Machine.

Production per day of 10 hours, allowing 10% off for oiling, cleaning, etc.

Revolutions per min. of 5 in. calender roll.	Grains per yard of lap produced.													
	200	210	220	230	240	250	260	270	280	290	300	310	320	330
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
45	303.1	318.2	333.4	348.5	363.7	378.8	394.0	409.1	424.3	439.4	454.6	469.7	484.9	500.0
50	336.7	353.6	370.4	387.2	404.1	420.9	437.8	454.6	471.4	488.3	505.1	522.0	538.8	555.6
55	370.4	388.9	407.4	426.0	444.5	463.0	481.5	500.0	518.6	537.1	555.6	574.1	592.6	611.2
60	404.1	424.3	444.5	464.7	484.9	505.1	525.3	545.5	565.7	585.9	606.1	626.3	646.5	666.7
65	437.7	459.6	481.5	503.4	525.3	547.2	569.1	591.0	612.9	634.7	656.6	678.5	700.4	722.3
70	471.4	495.0	518.5	542.1	565.7	589.3	612.8	636.4	660.0	683.5	707.1	730.7	754.2	777.8
80	538.7	565.7	592.6	619.6	646.5	673.4	700.4	727.3	754.3	781.2	808.1	835.1	862.0	889.0
90	606.1	636.4	666.7	697.0	727.3	757.6	787.9	818.2	848.5	878.8	909.1	939.4	969.7	1000.0
100	673.4	707.2	740.9	774.5	808.2	841.9	875.5	909.2	942.9	976.6	1010.2	1043.9	1077.6	1111.2

2.48 revolutions of driving pulley to 1 revolution of 5 in. calender roll.

Whitin Combing Machinery, Continued.



Ribbon Lap Machine.

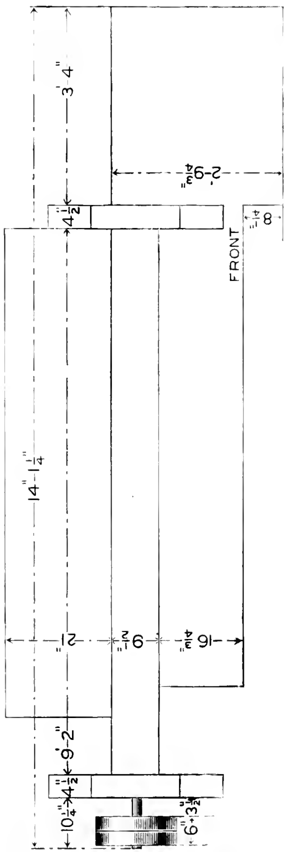
The object of this machine is so to prepare the laps for the combing machine that the web of the slivers will be of a more even and uniform structure than that of the sliver lap machine, thus placing the fibers in a better condition for the action of the comber.

Six laps from the sliver lap machine, each $7\frac{1}{2}''$ wide, are placed in the ribbon machine creel and drawn through four lines of fluted rolls with a draught of about six. Highly polished, brass covered, curved plates guide the ribbons evenly on top of each other onto the sliver plate, along which the ribbon is drawn through several press rolls to the lap head, where it is compressed and formed into a lap $8\frac{3}{4}''$ wide, ready for the comber. The machine is provided with a back stop motion, which stops the machine whenever a lap in the creel breaks down or runs out ; a full lap stop motion is also provided in the lap head, which insures laps of a uniform length.

Pulleys:—16″ diameter by 3″ face, 280 revolutions per minute.

Floor Space:—$14'$-$1\frac{1}{4}''$ by $4'$-$7\frac{1}{2}''$.

Whitin Combing Machinery, Continued.



Ribbon Lap Machine, Floor Plan.

Whitin Combing Machinery, Continued.

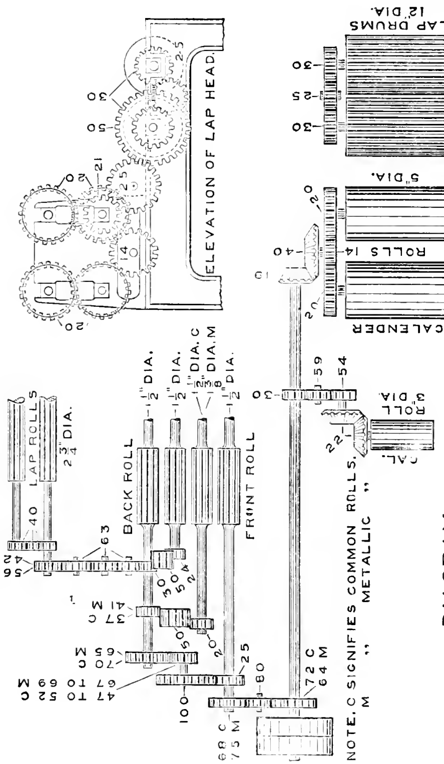


DIAGRAM OF GEARING OF WHITIN RIBBON LAP MACHINE.

Draught Table—Ribbon Lap Machine.

Table gives total draught in machine.

Change Gear.	Draught.	Change Gear.	Draught
47	6.40	50	6.02
48	6.27	51	5.90
49	6.14	52	5.78

Whitin Combing Machinery, Continued.

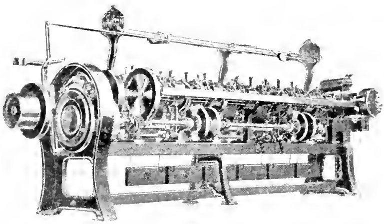
Ribbon Lap Machine.

Production per day of ten hours, allowing 10% off for cleaning, oiling, etc.

Revolutions per min. of 5 in. calender roll.	Grains per yard of lap produced.												
	200	210	220	230	240	250	260	270	280	290	300	310	320
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
85	572.4	601.0	629.7	658.3	686.9	715.5	744.1	772.8	801.4	830.0	858.6	887.2	915.9
90	606.1	636.4	666.7	697.0	727.3	757.6	787.9	818.2	848.5	878.8	909.1	939.4	969.7
95	639.8	671.7	703.7	735.7	767.7	799.7	831.7	863.7	895.7	927.7	959.7	991.6	1023.6
100	673.4	707.2	740.9	774.5	808.2	841.9	875.5	909.2	942.9	976.6	1010.2	1043.9	1077.6
105	707.1	742.5	777.8	813.2	848.5	883.9	919.3	954.6	990.0	1025.3	1060.7	1096.1	1131.4

3 revolutions of driving pulley to 1 revolution of 5 inch calender roll.

Whitin Combing Machinery, Continued.



Improved Combing Machine.

Our Improved Combing Machine will comb cotton from ⅞-inch staple to 2-inch staple without further change than setting or timing. This machine contains several features which are improvements on our old style machine, constituting a great advance, and largely increasing the economical value of the machine on all kinds of stock.

The specialties to be noticed in the construction of this machine are as follows:

Two sets of lifter and nipper cams are used instead of one set, as in our old style of machine. By this construction torsion of the nipper and lifter shafts is prevented and a better nip secured. The cams have been remodeled so as to eliminate the vibrations in the machine to a great extent, thereby rendering it possible to obtain a greater production, with equal quality, by increasing the speed to 100 nips per

Whitin Combing Machinery, Continued.

minute, where formerly 85 nips were considered the limit. The cans are cut by improved machinery, thus securing a smooth running motion at any speed.

The Owen feed roll stop motion (patent applied for) prevents breakages of nipper bars, half laps, and loss of production due to lap winding about the bottom feed roll.

A carrying roll is provided on the sliver plate, whereby the breakage of sliver before entering the draw-box is greatly reduced.

The circular comb brushes are driven by a variable gearing motion of three different speeds to compensate for the wear of the brushes. A traverse motion is also applied to the brush shaft, whereby the circular comb is cleaned much more effectively.

Half laps and fluted segments are made to templates, and are all set concentric with cylinder shaft. All half laps are interchangeable, as are also the fluted segments, and they will both interchange respectively with those on combing machines (of the same size of lap) made by John Hetherington & Sons. This feature commends itself to manufacturers using the Hetherington machines.

All shafts are supported in heavy bearings that are rigidly held, preventing all chances of displacement. The gearing is thoroughly guarded by covers.

All parts of the machine are made accurately to templates by the use of improved machinery so that necessary repairs will go into place readily without re-fitting.

The machine is built with six heads to take laps 8¾ inches wide. A coiler for a 9″, 10″, 11″ or 12″ diameter can is furnished with each machine.

The speed of the machine depends on the grade of stock used and quality of work desired. (See Production Table).

Directions for the setting and care of this machine will be sent on application.

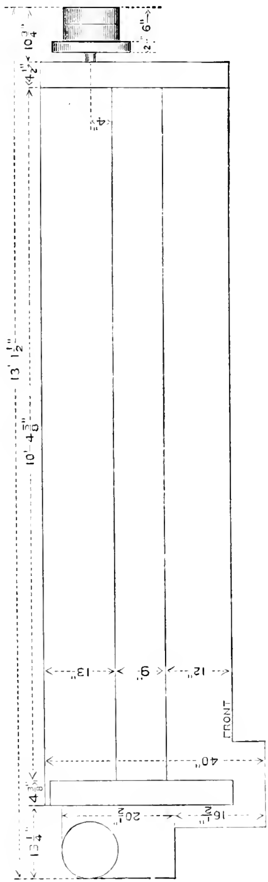
Pulleys:—10″ diameter by 3″ face and run 3.80 revolutions for every nip.

Power:—See Index for chapter on Horse Power.

Floor Space:—13′-1½″ by 3′-4″. (See Floor Plan).

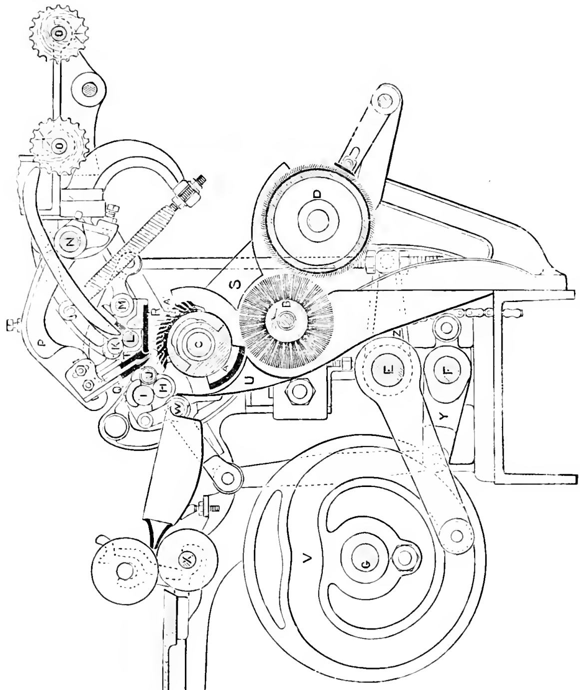
Extras Required:—Sliver cans 9″ to 12″ diameter, 36″ high, with spring bottoms. Three waste boxes for back of machine, to be made of sheet iron, fibre, or wood, of the following dimensions (outside):—30″ long, 12″ wide, back 26″ high, front 19″ high.

Whitin Combing Machinery, Continued.



Combing Machine, Floor Plan.

Whitin Combing Machinery, Continued.



Section of Combing Machine.

References.

A—Fluted Segment.
B—Brush.
C—Cylinder Shaft.
D—Doffer.
E—Nipper Shaft.
F—Large Lifter Shaft.
G—Cam Shaft.
H—Steel Drawing-off or Detaching Roll.
I—Brass Clearing Roll.
J—Leather Drawing-off Roll.
K—Top Feed Roll.
L—Bottom Feed Roll.
M—Nipper Arm Fulcrum.
N—Top Comb Shaft.
O—Lap Roll Shaft.
P—Top Comb Arm.
Q—Top Comb.
R—Cushion Plate,
S—Doffer Cover.
T—Nipper Knife.
U—Waste Chute
V—Nipper Cam.
W—Small Lifter Shaft.
X—Calender Roll Shaft.
Y—Lifter Shaft Lever.
Z—Nipper Shaft Lever.
A′—Half Lap.

Whitin Combing Machinery, Continued.

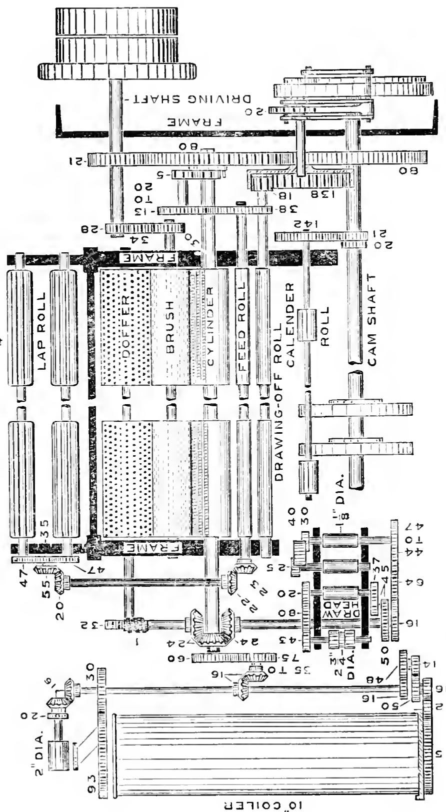


DIAGRAM OF GEARING OF WHITIN COMBER.

Whitin Combing Machinery, Continued.

Draught Table of Combing Machine.

Table gives total draught between $2\frac{3}{4}$ inch lap rolls and 2 inch coiler calender rolls.

With draw-head back roll change gear 46 teeth.

With draw-head front roll change gear 37 teeth.

Total draught in draw-head 4.41.

Change gear on coiler connecting shaft 69 teeth.

Feed Gear.	Total Draught.	Feed Gear.	Total Draught.
13 Teeth.	32.65	17 Teeth.	24.97
14	30.32	18	23.58
15	28.30	19	22.34
16	26.53	20	21.22

NOTE: — The change gears on coiler connecting shaft are 65 to 75 teeth, inclusive, and depending on the draught in the draw-head must be such as to take up what the draw-head calender roll delivers.

The draw-head back roll change gears are 44 to 47, inclusive, and should be such that the roll draws the slivers along the table as fast as delivered.

The draught in the draw-head is usually 4.41 but may be changed by changing the front roll change gear.

Whitin Combing Machinery, Concluded.

Combing Machine, Six Heads.

Table showing the number of pounds of combed sliver produced in one day of 10 hours, allowing 5 per cent. off for cleaning, oiling, etc.

Coiler connection gear 69 teeth.

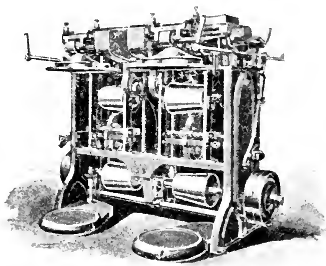
Nips per minute.	Grains per yard of combed sliver.															
	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs	Lbs	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs.	Lbs.	Lbs.
75	37.08	38.94	40.79	42.64	44.50	46.35	48.21	50.06	51.91	53.77	55.62	57.48	59.33	61.18	63.03	64.88
80	39.55	41.53	43.51	45.49	47.46	49.44	51.42	53.40	55.37	57.35	59.33	61.31	63.28	65.25	67.22	69.19
85	42.03	44.13	46.23	48.33	50.43	52.53	54.63	56.73	58.84	60.94	63.04	65.14	67.24	69.34	71.44	73.54
90	44.50	46.72	48.95	51.17	53.40	55.62	57.85	60.07	62.30	64.52	66.75	68.97	71.20	73.43	75.56	77.89
95	46.97	49.32	51.67	54.02	56.36	58.71	61.06	63.41	65.76	68.11	70.45	72.80	75.15	77.50	79.85	82.20
100	49.44	51.91	54.39	56.86	59.33	61.80	64.27	66.74	69.22	71.69	74.16	76.63	79.11	81.59	84.07	86.55
105	51.91	54.50	57.11	59.70	62.30	64.89	67.48	70.08	72.68	75.27	77.87	80.46	83.06	85.66	88.26	90.86
110	54.38	57.09	59.83	62.54	65.27	67.98	70.69	73.42	76.14	78.85	81.58	84.29	87.01	89.73	92.45	95.17
115	56.85	59.68	62.55	65.38	68.24	71.07	73.90	76.76	79.60	82.43	85.29	88.12	90.96	93.80	96.64	99.48
120	59.32	62.27	65.27	68.22	71.21	74.16	77.11	80.10	83.06	86.01	89.00	91.95	94.91	97.87	100.83	103.79
125	61.79	64.86	67.99	71.06	74.18	77.25	80.32	83.44	86.52	89.59	92.71	95.78	98.8[illegible]	101.94	105.02	108.10

3.80 revolutions of driving pulley to one nip.

RAILWAY HEADS,

Manufactured by

The Whitin Machine Works.



Double Railway Head.

This machine has been remodeled, and improvements introduced as experience in past years has suggested. We build the heads in single deliveries, or two deliveries are placed on one table, in which case each delivery is entirely independent of the other. The machines are arranged to double any number of ends up to ten into one.

The Steel Rolls are made with 8″ bosses. There are four lines of these rolls; the front one is 1⅜″ diameter, and the others are 1⅛″ diameter. A leather covered, shell front, top roll is used; the other top rolls are solid unless otherwise ordered. An improvement in the weighting of the top rolls is provided, whereby, in case of a lap-up, the pressure on the top rolls can be taken off by the relieving motion much more effectively than formerly. Direct or lever weighting of top rolls as preferred. Metallic drawing rolls can be supplied when ordered. **Campbell Ball Bearing Rolls** are also furnished when desired. The back rolls are positively driven by bevel gears and upright shaft from the bottom cone shaft, and the front roll is driven from the top cone shaft through a train of spur gears.

Whitin Drawing Machinery, Continued.

The Calender Roll Motion has been remodeled by substituting an extra heavy self weighting top roll in place of the screw clamps for increasing the pressure between the calender rolls. Perfect condensation of the sliver is obtained, and in case of a lap-up of the calender rolls the top roll can be released with much less trouble than by the former method. In combination with this heavy top roll we use our patented auxiliary swinging roll, the purpose of which is to turn the sliver downward into the coiler snout, thus avoiding the necessity of threading the coiler snout.

Mechanical Stop-Motions of a simple and reliable nature are provided for the back, front, and full can. In the back stop-motion a roll is placed just forward of the sliver spoons for the purpose of keeping all the slivers at the same tension. The distance of the spoons from the back roll is such that the machine is stopped before a broken end goes in, and piecing up is very readily accomplished. Our patented front stop-motion is effective in case of a lap-up of rolls or the trumpet becoming choked up. The full-can stop-motion is operated by the pressure of the cotton in the can against the face plate of coiler. In case of an extra high speed of the machine an automatic brake motion is provided for the driving pulley.

The Evener Motion is very effective in responding instantly to the variations in the weight of sliver owing to the use of a coarse threaded screw, a wider cone belt, and an efficient cone belt binder.

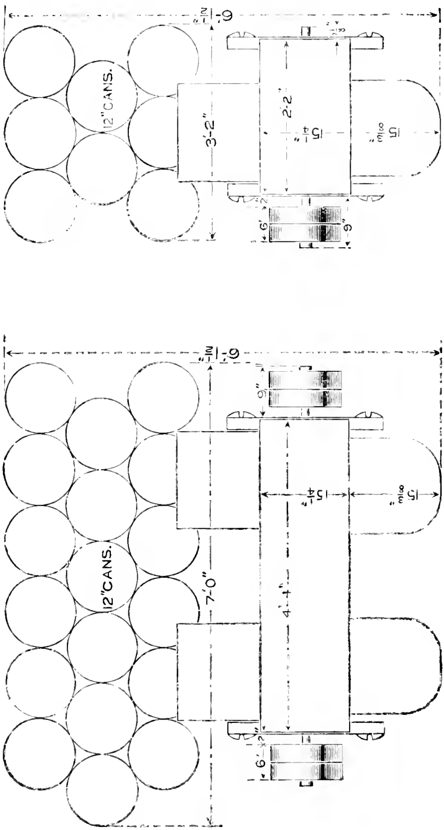
All gears are cut to give quiet and easy running and are thoroughly guarded with covers which can be conveniently opened for cleaning or oiling purposes.

Driving Pulleys:—8¼″ to 16″ diameter, 2″ and 3″ face.

Can Tables:—For 10″, 11″, 12″, and 14″ diameter cans.

Floor Space, without cans at the back:—Single Head over all, 3′-1⅛″ by 3′-7½″. Double Head, 5′-10″ by 3′-7½″.

Whitin Drawing Machinery, Continued.



Coiler Railway Heads, Floor Plans.

Whitin Drawing Machinery, Continued.

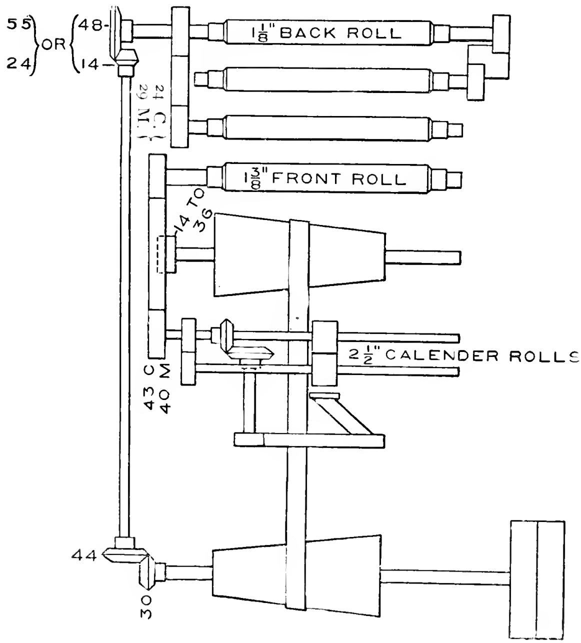


Diagram of Gearing of Coiler Railway Head.

Whitin Drawing Machinery, Continued.

Draught Table of Coiler Railway Head

With Upright Shaft.

Table showing total Draught between Back Roll and Calender Roll.

Diameter of { Back Roll, $1\frac{1}{8}$ inches.
Calender Roll, $2\frac{1}{2}$ inches.

Back Roll Bevel Gear, 48 Teeth.

Upright Shaft Top Bevel, 14 Teeth.

Change Pinion on Cone.	Draught with Common Rolls.	Draught with Metallic Rolls.
14 T.	3.64	2.64
15	3.90	2.83
16	4.16	3.02
17	4.42	3.21
18	4.68	3.39
19	4.94	3.58
20	5.20	3.77
21	5.46	3 96
22	5.72	4.15
23	5.98	4.34
24	6.24	4.53
25	6.50	4.71
26	6.76	4.90
27	7.02	5.09
28	7.28	5.28
29	7.54	5.47
30	7.80	5.66
31	8.06	5.85
32	8.32	6.03
33	8.58	6.22
34	8.84	6.41
35	9.10	6.60
36	9.36	6.79

In the above table, the draught with metallic rolls is only approximately correct, and will generally vary with weight of sliver, etc.

Whitin Drawing Machinery, Continued.

Production of Railway Head with Back Stop-Motion.

Table showing number pounds Railway Sliver produced in one day of 10 hours, allowing 5 per cent. for cleaning, oiling, etc.

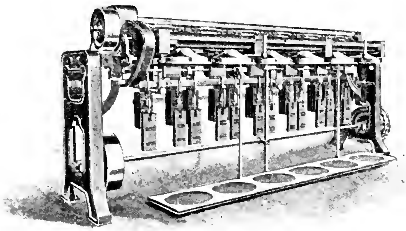
Rev. of Front Roll per Min.	Number of Grains in one yard of Sliver.																Rev. of Front Roll per Min.
	40		50		60		70		80		90		100		110		
	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	
300	118.8	154.8	148.5	193.5	178.2	232.2	207.9	270.9	237.6	309.6	267.3	348.3	297.0	387.0	326.7	425.7	300
315	124.7	162.5	155.9	203.2	187.1	243.8	218.3	288.4	249.5	325.1	280.7	365.7	311.9	406.4	343.0	447.0	315
330	130.7	170.3	163.4	212.9	196.0	255.4	228.7	298.0	261.4	340.6	294.0	383.1	326.7	425.7	359.4	468.3	330
345	136.6	178.0	170.8	222.5	204.9	267.0	239.1	311.5	273.2	356.0	307.4	400.5	341.6	445.1	375.7	489.6	345
360	142.6	185.8	178.2	232.2	213.8	278.6	249.5	325.1	285.1	371.5	320.8	418.0	356.4	464.4	392.0	510.8	360
375	148.5	193.5	185.6	241.9	222.8	290.2	259.9	338.6	297.0	387.0	334.1	435.4	371.3	483.8	408.4	532.1	375
390	154.4	201.2	193.1	251.6	231.7	301.9	270.3	352.2	308.9	402.5	347.5	452.8	386.1	503.1	424.7	553.4	390
405	160.4	209.0	200.5	261.2	240.6	313.5	280.7	365.7	320.8	418.0	360.9	470.2	401.0	522.5	441.1	574.7	405
420	166.3	216.7	207.9	270.9	249.5	325.1	291.1	379.3	332.6	433.4	374.2	487.6	415.8	541.8	457.4	596.0	420
435	172.3	224.5	215.3	280.6	258.0	336.7	301.5	392.8	344.5	448.9	387.6	505.0	430.7	561.2	473.7	617.3	435
450	178.2	232.2	222.8	290.3	267.3	348.3	311.9	406.4	356.4	464.4	401.0	522.5	445.5	580.5	490.1	638.6	450
465	184.1	239.9	230.2	299.9	276.2	359.9	322.2	419.9	368.3	479.9	414.3	539.9	460.4	599.9	506.4	659.8	465
480	190.1	247.7	237.6	309.6	285.1	371.5	332.6	433.4	380.2	495.4	427.7	557.3	475.2	619.2	522.7	681.1	480
495	196.0	255.4	245.0	319.3	294.0	383.1	343.0	447.0	392.0	510.8	441.0	574.7	490.1	638.6	539.1	702.4	495
510	202.0	263.2	252.5	329.0	302.9	394.7	353.4	460.5	403.9	526.3	454.4	592.1	504.9	657.9	555.4	723.7	510
525	207.9	270.9	259.9	338.6	311.9	406.4	363.8	474.1	415.8	541.8	467.8	609.5	519.8	677.3	571.7	745.0	525
540	213.8	278.6	267.3	348.3	320.8	418.0	374.2	487.6	427.7	557.3	481.1	626.9	534.6	696.6	588.1	766.2	540
555	219.8	286.4	274.7	358.0	329.7	429.6	384.6	501.2	439.6	572.8	494.5	644.4	549.5	716.0	604.4	787.5	555
570	225.7	294.1	282.2	367.7	338.6	441.2	395.0	514.7	451.4	588.2	507.9	661.8	564.3	735.3	620.7	808.8	570
585	231.7	301.9	289.6	377.3	347.5	452.8	405.4	528.3	463.3	603.7	521.2	679.2	579.2	754.7	637.1	830.1	585
600	237.6	309.6	297.0	387.0	356.4	464.4	415.8	541.8	475.2	619.2	534.6	696.6	594.0	774.0	653.4	851.4	600

NOTE: — Met. = Metallic. Com. = Common.

DRAWING FRAMES,

Manufactured by

The Whitin Machine Works.



Six Delivery Head.

Our Coiler Drawing Frame is built from new and improved patterns and is of an unusually strong and substantial design. The coilers and can tables are made for 10″, 11″ and 12″ cans.

The Drawing Rolls, all of crucible steel, are in four lines, 16 inches in length from centre to centre of stands, and made for all slivers to run on a single boss for each delivery. The bottom front roll is $1\frac{3}{8}$″ diameter, the back and middle rolls are $1\frac{1}{8}$″ diameter. Roll bearing stands are provided with brass steps, which are easily renewed when worn out. Metallic drawing rolls can be supplied when ordered. Also **Campbell Ball Bearing Rolls** will be furnished when specified. The top rolls are made with loose end bearings which possess the advantage of being easily and quickly oiled without the necessity of removing the rolls or stopping the machine ; they also cause less friction as the weight hooks or saddles are not in contact with the moving surfaces of the rolls. Direct weighting of top rolls is used in connection with an efficient relieving motion.

Whitin Drawing Machinery, Continued.

The Calender Rolls are made of steel, 3 inches in diameter and 26 inches long; the driving calender roll runs in fixed bearings, while the outer calender roll bearings are movable in inclined bearing seats, by means of which the weight of the roll effects a thorough condensation of the sliver.

The Draught Gear is easily and quickly changed by means of a swivel adjusting stand, which is always concentric with the front roll gear. The draught between front and calender rolls may be varied to a very small degree to suit the stock and weather changes by the use of compensating gears of large diameters for which purpose change gears are provided.

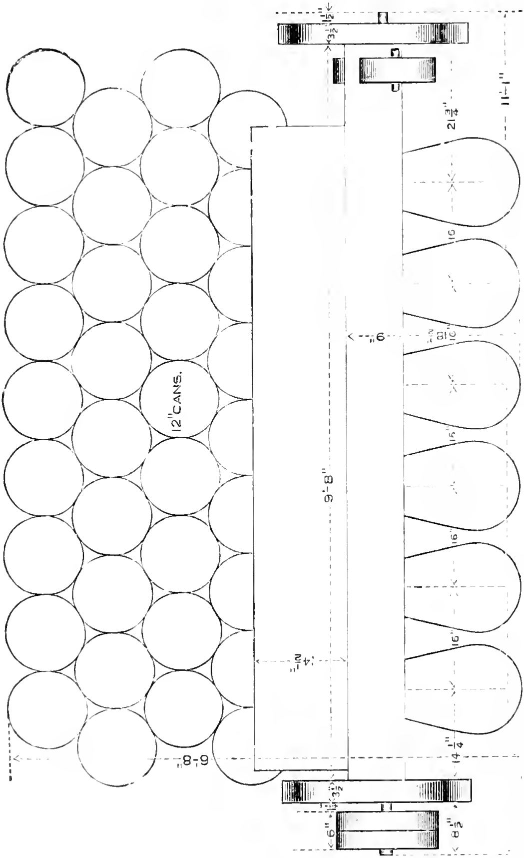
Stop Motions are mechanical throughout, and consist of back, front, and full-can motions. All are simple and effective in action and are not likely to get out of order. Our patented full-can stop-motion is operated by only a slight pressure of the cotton on the face plate of the coiler when the can becomes filled. This feature will be appreciated as the cans are never overfilled nor is the cotton so closely packed into the can as to injure its quality in subsequent operations.

Can Tables are so arranged as to hold cans 36″ high without the necessity of cutting into the floor.

The Roll Gears having machine cut teeth insures an easy and quiet running machine. All gearing is thoroughly guarded with covers thereby providing against accidents to the operators.

The Driving Pulleys on the lower shaft are from 8″ diameter to 16″ diameter, from $1\frac{7}{8}$″ face to $5\frac{1}{2}$″ face, and run one revolution to $1\frac{5}{11}$ revolutions of front roll.

Whitin Drawing Machinery, Continued.



Coiler Drawing Frame, Floor Plan.

Floor Space, exclusive of driving pulleys and sides of frames, tables 9″ wide, and lengths as follows :

3	lengths of rolls,	3	boss.	Whole length of table,	5′-8″	3	deliveries.
4	" " "	4	"	" " " "	7′-0″	4	"
5	" " "	5	"	" " " "	8′-4″	5	"
6	" " "	6	"	" " " "	9′-8″	6	"

To obtain length of frame over all, add 17″ to table lengths above.

To economize floor space two or more tables may be coupled together.

Whitin Drawing Machinery, Continued.

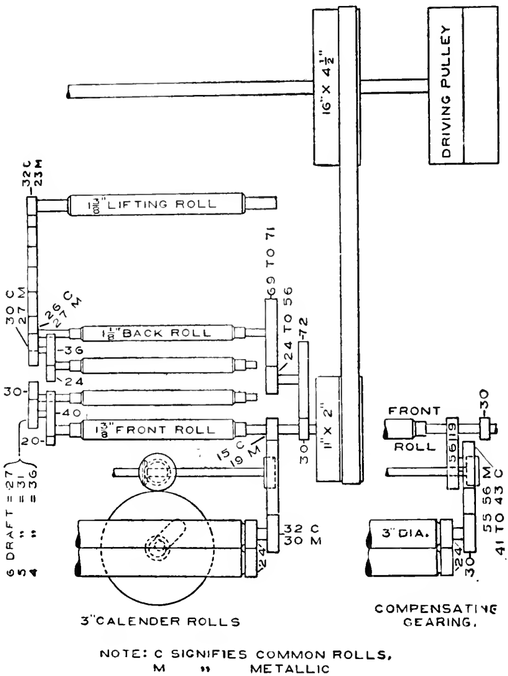


Diagram of Gearing of Coiler Drawing Frame, with 3-in. Calender Rolls.

Whitin Drawing Machinery, Continued.

Draught Table of Coiler Drawing Frame with 3 in. Calender Rolls.

Table shows Total Draught between Back Roll and Calender Roll.

Diameter of { Back Roll, $1\frac{1}{4}$ inches. Calender Roll, 3 inches. } Compensating Gears { 55 Teeth with Metallic Rolls. 42 Teeth with Common Rolls. }

Back Roll Change Gear 69 Teeth.			Back Roll Change Gear 70 Teeth.			Back Roll Change Gear 71 Teeth.		
Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.	Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.	Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.
24 Teeth.	8.71	7.73	24 Teeth.	8.87	7.84	24 Teeth.	9.00	7.96
25	8.39	7.43	25	8.51	7.53	25	8.63	7.64
26	8.06	7.13	26	8.18	7.24	26	8.30	7.34
27	7.76	6.87	27	7.88	6.97	27	7.99	7.07
28	7.49	6.63	28	7.60	6.72	28	7.71	6.82
29	7.23	6.40	29	7.34	6.49	29	7.44	6.58
30	6.99	6.18	30	7.09	6.27	30	7.19	6.37
31	6.75	5.99	31	6.86	6.08	31	6.95	6.15
32	6.55	5.79	32	6.65	5.88	32	6.74	5.97
33	6.37	5.62	33	6.44	5.71	33	6.54	5.78
34	6.17	5.46	34	6.26	5.53	34	6.35	5.61
35	5.99	5.30	35	6.08	5.38	35	6.17	5.46
36	5.83	5.16	36	5.91	5.23	36	6.00	5.30
37	5.67	5.01	37	5.75	5.09	37	5.83	5.16
38	5.52	4.88	38	5.60	4.95	38	5.68	5.02
39	5.38	4.76	39	5.45	4.83	39	5.53	4.89
40	5.24	4.64	40	5.32	4.71	40	5.39	4.77

In the above table, the draught with metallic rolls is only approximately correct and will generally vary with weight of sliver, etc.

(Continued on next page.)

Whitin Drawing Machinery, Continued.

Draught Table of Coiler Drawing Frame, with 3 in. Calender Rolls.

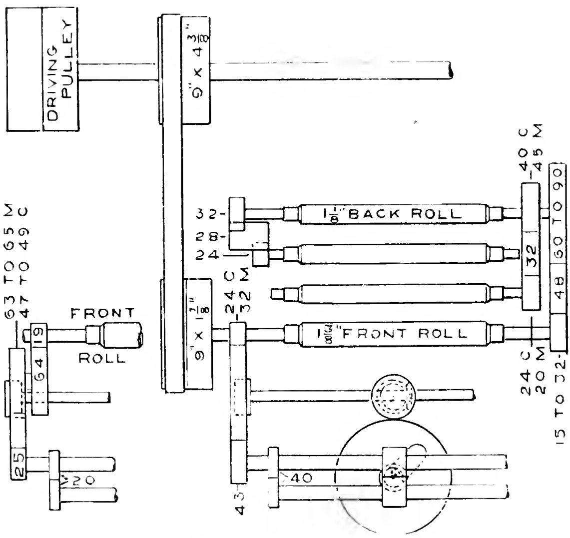
Table shows Total Draught between Back Roll and Calender Roll.

Diameter of { Back Roll, $1\frac{1}{8}$ inches. Calender Roll, 3 inches. } Compensating Gears { 55 Teeth with Metallic Rolls. 42 Teeth with Common Rolls. }

Back Roll Change Gear 69 Teeth.			Back Roll Change Gear 70 Teeth.			Back Roll Change Gear 71 Teeth.		
Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.	Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.	Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.
41 Teeth.	5.11	4.53	41 Teeth.	5.19	4.59	41 Teeth	5.26	4.65
42	5.00	4.42	42	5.06	4.48	42	5.15	4.54
43	4.88	4.31	43	4.95	4.38	43	5.01	4.44
44	4.77	4.22	44	4.84	4.27	44	4.91	4.34
45	4.66	4.12	45	4.73	4.18	45	4.80	4.24
46	4.56	4.04	46	4.63	4.09	46	4.69	4.15
47	4.46	3.94	47	4.53	4.00	47	4.59	4.06
48	4.37	3.86	48	4.43	3.92	48	4.50	3.97
49	4.28	3.79	49	4.34	3.84	49	4.41	3.90
50	4.19	3.71	50	4.26	3.76	50	4.32	3.82
51	4.11	3.63	51	4.17	3.69	51	4.23	3.74
52	4.03	3.57	52	4.09	3.62	52	4.15	3.67
53	3.96	3.49	53	4.01	3.55	53	4.07	3.60
54	3.88	3.44	54	3.94	3.49	54	4.00	3.54
55	3.81	3.37	55	3.87	3.42	55	3.92	3.47
56	3.74	3.31	56	3.80	3.36	56	3.85	3.41

In the above table, the draught with metallic rolls is only approximately correct and will generally vary with weight of sliver, etc.

Whitin Drawing Machinery, Continued.



NOTE.—C signifies Common Rolls.
M " Metallic "

Diagram of Gearing of Coiler Drawing Frame, with 2½-in. Calender Rolls.

Whitin Drawing Machinery, Continued.

Draught Table of Coiler Drawing Frame with 2½ in. Calender Rolls.

Table shows Total Draught between Back Roll and Calender Roll.

Diameter of { Back Roll, 1⅛ inches. Calender Roll, 2½ inches.   Compensating Gears { 63 Teeth with Metallic Rolls. 47 Teeth with Common Rolls.

Back Roll Change Gear 72 Teeth.			Back Roll Change Gear 82 Teeth.			Back Roll Change Gear 88 Teeth.		
Front Roll Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.	Front Roll Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.	Front Roll Change Gear.	Draught with Common Rolls.	Draught with Metallic Rolls.
15 Teeth.	5.95	5.39	15 Teeth.	6.78	6.13	15 Teeth.	7.28	6.58
16	5.58	5.05	16	6.36	5.75	16	6.82	6.17
17	5.25	4.75	17	5.98	5.41	17	6.42	5.81
18	4.96	4.49	18	5.65	5.11	18	6.06	5.49
19	4.70	4.25	19	5.35	4.84	19	5.74	5.20
20	4.47	4.04	20	5.09	4.60	20	5.46	4.94
21	4.25	3.85	21	4.84	4.38	21	5.20	4.70
22	4.06	3.67	22	4.62	4.18	22	4.96	4.49
23	3.88	3.51	23	4.42	4.00	23	4.76	4.29
24	3.72	3.37	24	4.24	3.83	24	4.55	4.11
25	3.57	3.23	25	4.07	3.68	25	4.37	3.95
26	3.43	3.11	26	3.91	3.54	26	4.20	3.80
27	3.31	2.99	27	3.77	3.41	27	4.04	3.66
28	3.19	2.89	28	3.63	3.29	28	3.90	3.53
29	3.08	2.79	29	3.51	3.17	29	3.76	3.41
30	2.98	2.69	30	3.39	3.07	30	3.64	3.29
31	2.88	2.61	31	3.28	2.97	31	3.52	3.19
32	2.79	2.53	32	3.18	2.88	32	3.41	3.09

In the above table, the draught with metallic rolls is only approximately correct and will generally vary with weight of sliver, etc.

Whitin Drawing Machinery, Continued.

Production of Drawing Frame, with 3 in. Calender Rolls.

Table showing number pounds Drawing Sliver produced in one day of 10 hours, allowing 10 per cent. for cleaning, oiling, etc.

Rev. of Front Roll per Min.	Number of Grains in one yard of Sliver.																	
	35		40		45		50		55		60		65		70		75	
	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll
250	84.0	109.9	96.0	125.6	108.0	141.3	120.0	157.0	132.0	172.7	144.0	188.4	156.0	204.1	168.0	219.8	180.0	235.5
260	87.4	114.3	99.8	130.6	112.3	147.0	124.8	163.3	137.3	179.6	145.8	195.9	162.2	212.3	174.7	228.6	187.2	244.9
270	90.7	118.7	103.7	135.6	116.6	152.6	129.6	169.6	142.6	186.5	155.5	203.5	168.5	220.4	181.4	237.4	194.4	254.3
280	94.1	123.1	107.5	140.7	121.0	158.3	134.4	175.8	147.8	193.4	161.3	211.0	174.7	228.6	188.2	246.2	201.6	263.8
290	97.4	127.5	111.4	145.7	125.3	164.0	139.2	182.1	153.1	200.3	167.0	218.5	181.0	236.8	194.9	255.0	208.8	273.2
300	100.8	131.9	115.2	150.7	129.6	169.6	144.0	188.4	158.4	207.2	172.8	226.1	187.2	244.9	201.6	263.8	216.0	282.6
310	104.2	136.3	119.0	155.7	133.9	175.2	148.8	194.7	163.7	214.1	178.6	233.6	193.4	253.1	208.3	272.6	223.2	292.0
320	107.5	140.7	122.9	160.8	138.2	180.9	153.6	201.0	169.0	221.1	184.3	241.2	199.7	261.2	215.0	281.4	230.4	301.4
330	110.9	145.1	126.7	165.8	142.6	186.5	158.4	207.2	174.2	228.0	190.1	248.7	205.9	269.4	221.8	290.1	237.6	310.9
340	114.2	149.5	130.6	170.8	146.9	192.2	163.2	213.5	179.5	234.9	195.8	256.2	212.2	277.6	228.5	298.9	244.8	320.3
350	117.6	153.9	134.4	175.8	151.2	197.8	168.0	219.8	184.8	241.8	201.6	263.8	218.4	285.7	235.2	307.7	252.0	329.7
360	121.0	158.3	138.2	180.9	155.5	203.5	172.8	226.1	190.1	248.7	207.3	271.3	224.6	293.9	241.9	316.5	259.2	339.1
370	124.3	162.7	142.1	185.9	159.8	209.1	177.6	232.4	195.4	255.6	213.1	278.8	230.9	302.1	248.6	325.3	266.4	348.5
380	127.7	167.0	145.9	190.9	164.2	214.8	182.4	238.6	200.6	262.5	218.9	286.4	237.1	310.2	255.4	334.1	273.6	358.0
390	131.0	171.4	149.8	195.9	168.5	220.4	187.2	244.9	205.9	269.4	224.6	293.9	243.4	318.4	262.1	342.9	280.8	367.4
400	134.4	175.8	153.6	201.0	172.8	226.1	192.0	251.2	211.2	276.3	230.4	301.4	249.6	326.6	268.8	351.7	288.0	376.8
410	137.8	180.2	157.4	206.0	177.2	231.7	196.8	257.5	216.5	283.2	236.2	309.0	255.8	334.7	275.5	360.5	295.2	386.2
420	141.1	184.6	161.3	211.0	181.4	237.4	201.6	263.8	221.8	290.1	242.0	316.5	262.1	342.9	282.2	369.3	302.4	395.6
430	144.5	189.0	165.1	216.0	185.8	243.0	206.4	270.0	227.0	297.0	247.7	324.0	268.3	351.1	289.0	378.1	309.6	405.1
440	147.8	193.4	169.0	221.1	190.1	248.7	211.2	276.3	232.3	304.0	253.4	331.6	274.6	359.2	295.7	386.8	316.8	414.5
450	151.2	197.8	172.8	226.1	194.4	254.3	216.0	282.6	237.6	310.9	259.2	339.1	280.8	367.4	302.4	395.6	324.0	423.9

NOTE: — Met.=Metallic. Com.=Common.

Whitin Drawing Machinery, Concluded.

Production of Drawing Frame, with 2½ in. Calender Rolls.

Table showing number pounds Drawing Sliver produced in one day of 10 hours, allowing 10 per cent. for cleaning, oiling, etc.

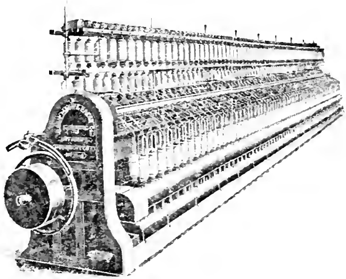
Rev. of Front Roll per Min.	Number of Grains in one yard of Sliver.																	
	35		40		45		50		55		60		65		70		75	
	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll	Com. Roll	Met. Roll
250	83.9	112.0	95.9	128.0	107.9	144.0	119.9	160.0	131.9	175.9	143.9	191.9	155.9	207.9	167.9	223.9	179.9	239.9
260	87.3	116.4	99.8	133.1	112.2	149.7	124.7	166.3	137.2	183.0	149.6	199.6	162.1	216.3	174.6	232.9	187.1	249.5
270	90.7	120.9	103.6	138.2	116.5	155.5	129.5	172.7	142.5	190.0	155.4	207.3	168.3	224.6	181.3	241.8	194.3	259.1
280	94.0	125.4	107.5	143.3	120.8	161.2	134.3	179.1	147.8	197.1	161.1	215.0	174.6	232.9	188.0	250.8	201.5	268.7
290	97.4	129.9	111.3	148.4	125.2	167.0	139.1	185.5	153.0	204.1	166.9	222.7	180.8	241.2	194.8	259.8	208.7	278.3
300	100.7	134.4	115.2	153.6	129.5	172.7	143.9	191.9	158.3	211.1	172.6	230.3	187.0	249.5	201.5	268.7	215.9	287.9
310	104.1	138.8	119.0	158.7	133.8	178.5	148.7	198.3	163.6	218.2	178.4	238.0	193.3	257.8	208.2	277.7	223.1	297.5
320	107.5	143.3	122.8	163.8	138.1	184.3	153.5	204.7	168.9	225.2	184.1	245.7	199.5	266.2	214.9	286.6	230.3	307.1
330	110.8	147.8	126.7	168.9	142.4	190.0	158.3	211.1	174.2	232.2	189.9	253.4	205.8	274.5	221.6	295.6	237.5	316.7
340	114.2	152.3	130.5	174.0	146.7	195.8	163.1	217.5	179.4	239.3	195.6	261.0	212.0	282.8	228.3	304.5	244.7	326.3
350	117.5	156.8	134.4	179.1	151.0	201.5	167.9	223.9	184.7	246.3	201.4	268.7	218.2	291.1	235.1	313.5	251 9	335.9
360	120.9	161.2	138.2	184.3	155.4	207.3	172.7	230.3	190.0	253.4	207.1	276.4	224.5	299.4	241.8	322.5	259.1	345 5
370	124.2	165.7	142.0	189.4	159.7	213.1	177.5	236.7	195.3	260.4	212.9	284.1	230.7	307.7	248.5	331.4	266.3	355.1
380	127.6	170.2	145.9	194.5	164.0	218.8	182.3	243.1	200.5	267.4	218.7	291.7	236.9	316.1	255.2	340.4	273.5	364.7
390	131.0	174.7	149.7	199.6	168.3	224.6	187.1	249.5	205.8	274.5	224.4	299.4	243.2	324.4	261.9	349.3	280.7	374.3
400	134.3	179.1	153.6	204.7	172.6	230.3	191.9	255.9	211.1	281.5	230 2	307.1	249.4	332.7	268.6	358.3	287.9	383.9
410	137.7	183.6	157.4	209.9	176.9	236.1	196.7	262.3	216.4	288.5	235.9	314.8	255.6	341.0	275.4	367.2	295.1	393.5
420	141.0	188.1	161.2	215.0	181.3	241.8	201.5	268.7	221.6	295.6	241.7	322.5	261.9	349.3	282.1	376.2	302.3	403.1
430	144.4	192.6	165.1	220.1	185.6	247.6	206.2	275.1	226.9	302.6	247.4	330.1	268.1	357.6	288.8	385.2	309.5	412.7
440	147.7	197.1	168.9	225.2	189.9	253.4	211.0	281.5	232.2	309.7	253.2	337.8	274.3	366.0	295.5	394.1	316.7	422.3
450	151 1	201.5	172.7	230.3	194.2	259.1	215.8	287.9	237.5	316.7	258.9	345.5	280.6	374.3	302.2	403.1	323.8	431.9

NOTE: — Met.=Metallic. Com.=Common.

SLUBBING, INTERMEDIATE, ROVING AND JACK FRAMES,

Manufactured by

Woonsocket Machine and Press Co.



For more than twenty years prior to 1888 these frames were built and sold by the CITY MACHINE CO. OF PROVIDENCE, R. I.

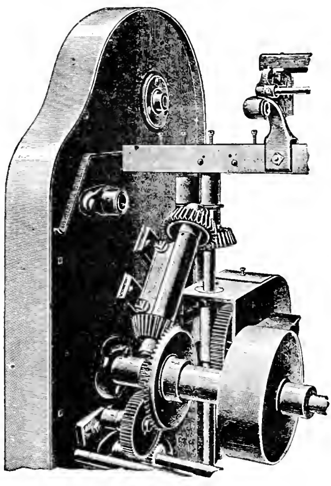
In 1888 the WOONSOCKET MACHINE AND PRESS CO. bought and removed to their works in Woonsocket, R. I., all of the patents, both old and new style, special machinery, jigs, etc., for the manufacture of the frame; since which time we have by way of improvements been able to supply the market with a first-class machine.

Among the most notable of the improvements was the introduction of the 1891 single gear horse head, doing away with a great portion of the (commonly called) back lash, and the necessity of small high speed gearing, together with the device by which we did away with an enormous amount of friction, necessarily caused heretofore by the compound sleeve revolving in an opposite direction from the main shaft.

These, as well as a number of other patented improvements in the same year, were eclipsed in 1894 by the invention and introduction of the "vertical shaft," doing away with the horse head entirely, and getting a positive drive between the main and bobbin shafts, through an angle shaft, vertical shaft, and sliding gear, thereby giving an *even* tension to the roving at all points of the traverse—a thing that is impossible with the horse head or train of gears following the rail up and down.

Woonsocket Roving Machinery, Continued.

In 1895 Daly's Differential Motion and our Patent Contact Gearing were added, Steel Clearer Covers and Steel Casings in 1896, Steel Draft Gear Bonnet and Safety Cone Catch in 1897, and in 1898 our Patent Self-Oiling Spindle Step and Campbell's Ball Bearing Top Roll; making, as we believe, the most complete, up-to-date Fly Frame on the market.



Vertical and Angle Shaft.

One of the important parts in the manipulation of cotton is to avoid all possible stretch, especially an uneven stretch, which leaves the roving light and heavy at intervals, and it has been the object of every machine manufacturer to overcome what is known as the "give and take" on a roving frame, which is caused by the horse head. The horse head has two motions; one is the rotary motion given to the gearing, and one the traverse motion given to the horse head by the traverse of the rail to which one end of the horse head is attached, while the rail, traversing the intermediate on the head, is traveling around the gear on the main shaft, and also around the gear on the bobbin shaft, either against the motion of said gear or with the motion, according to the direction in which the rail is traveling.

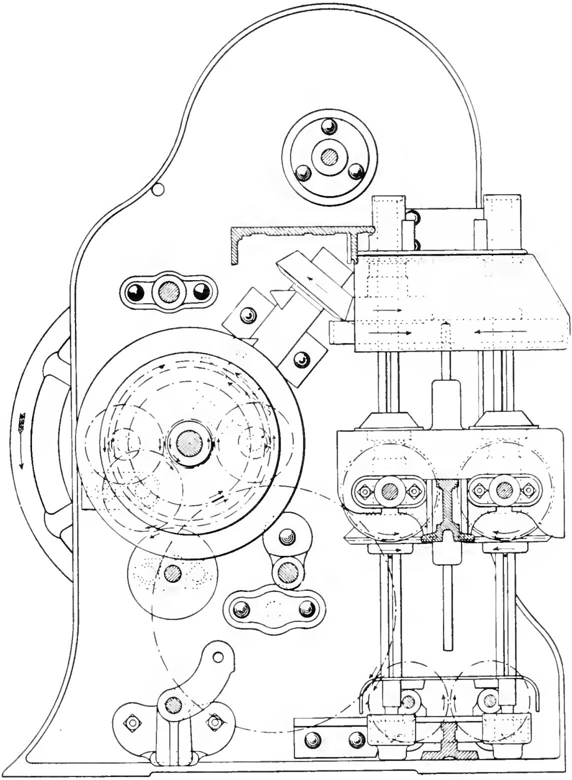
Woonsocket Roving Machinery, Continued.

The makers of what is known as the large intermediate gear horse head claim that with that system they set the main or jack shaft exactly in the center of the traverse of the rail, so that the rail goes the same distance above the shaft as it does below, and their claim is that the gear of the bobbin shaft takes up or lets off what the sleeve gear lets off or takes up, according to the motion of the rail. Theoretically, this may seem correct, but practically it is far from being so, especially in frames where the sleeves or bell gear is larger than the bobbin-shaft gear, say as a proportion of 50 to 37: it will be seen that it will be impossible for the 37-tooth gear to take up or let off what the 50-tooth gear will give it. The result, therefore, is an uneven stretch to the roving, not so much noticed on fine as on coarse frames, but nevertheless it is there. Also, there is a loss or gain of motion each change of the rail at top and bottom, caused by the rail changing its direction, which causes a slackness or a stretch of the roving.

Our Vertical Shaft does away with all gain or loss, as it will be seen that the motion of the gears is always continuous in one direction, regardless of the direction taken by the rail.

Twin Vertical Shaft.—Our new frames are now being built with twin vertical shafts; this construction possesses all the advantages of the single vertical shaft, and also the following very important additional one, viz.: Each bobbin shaft is now driven independently, greatly relieving the small gear that formerly drove both bobbin shafts, almost entirely eliminating the item of repairs due to breakage and wear and tear on these frames.

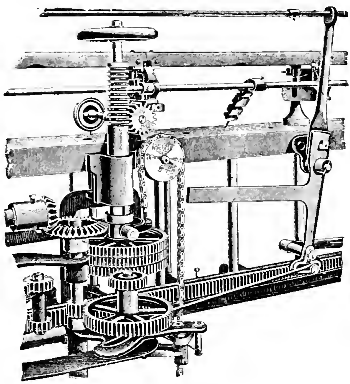
Woonsocket Roving Machinery, Continued.



SECTION BETWEEN HEAD END AND FIRST SAMPSON
SHOWING SPINDLE AND BOBBIN SHAFT GEARING.

Twin Vertical Shaft.

Woonsocket Roving Machinery, Continued.



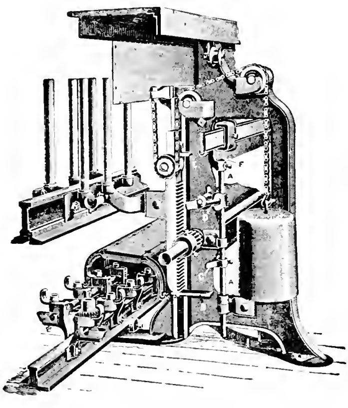
Contact Gearing.

Overseers of carding and roving machinery have found it very difficult at times to get just the proper tension of the cotton on fly frames, on account of the atmospheric changes, and also by the extreme change made by changing one tooth, which was made absolute when a contact-gear was changed. Usually the change is about one-fortieth. This would either cause the cotton to run too tight or too slack, as the case might be; therefore, either stretching the cotton and making it run light, or slacking to such an extent as to cause it to run heavy, which, of course, means to the mill man uneven weight of cloth, besides smaller productions from his frames.

The object of the patented improvement is to overcome, as far as practicable, all of the above conditions, and at the same time make it convenient for the overseer or his second-hand to make the required change without having first to look up a gear, and afterward a wrench, beside the disagreeable work of having to crawl down under his frame to make the desired change, which he does not usually care to do, and very often he does not make the change, on account of the extra work to which it puts him.

Woonsocket Roving Machinery, Continued.

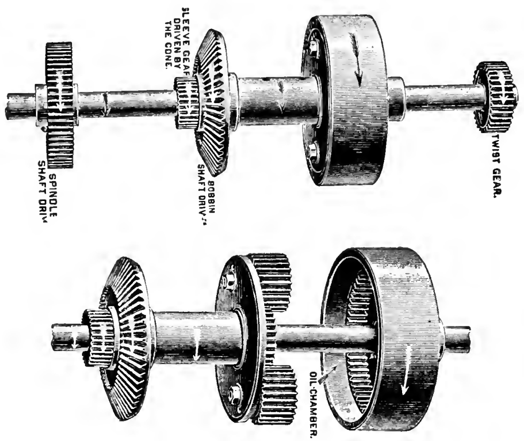
With our patent improvement the change is all made from the front of the frame, and all that is required to be done is to unlock the controlling wheel and turn the handle to the right or left, as the case may require, which will make the change on coarse frames of one-eightieth, and on fine jack frames a change of one ninety-fifth. The change is very fine, and the cotton can be controlled to a fineness never before acquired by any other arrangement. With this arrangement, the cone belt always returns to its proper starting point, so that the tension will be proper when starting on the empty bobbin.



Safety Stop Motion.

This stop motion is to prevent accident to the machine. Should the reverse motion fail to work the rail would travel beyond its limit ; this would allow the projections B and E on the lifting rack to come in contact with figures C or D, which would cause the rod A to move upward and come in contact with and lift the knock-off latch by the projection F, thereby stopping the frame and preventing serious breakdown of machine.

Woonsocket Roving Machinery, Continued.



Daly's Differential Motion.

This overcomes entirely what every maker in the country has struggled to overcome, viz: The great amount of friction and breakage caused by the several bevel gears of the old-style differential moving at double the speed of the jack-shaft; as, in the old-style the differential gearing is running in opposite direction to the jack-shaft, at about the same speed. Hence, with a jack-shaft running at 450 revolutions you have a set of gearing traveling 900 revolutions on a fixed bearing, demanding aid, which must come from the cone drums before they may effect the work for which they are intended; thus producing an uneven motion.

Advantages of this gearing:

(1). The highest speed gear makes less than 100 revolutions per minute.

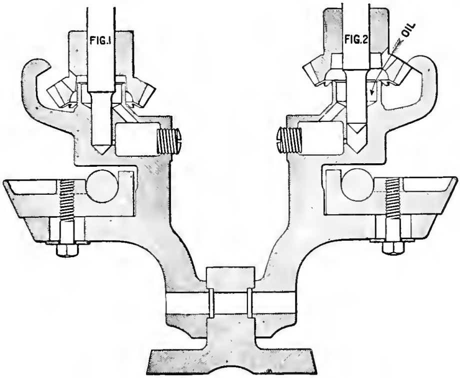
(2). All motions in one direction, thereby reducing friction and saving oil.

(3) The cone is no longer a driver but is now only a regulator, as the power is taken direct from the main shaft; therefore there is no more trouble caused by cone belts breaking or slipping.

(4). The gearing is covered from dust.

(5). Oil chambers for oil.

Woonsocket Roving Machinery, Continued.



Self-Oiling Spindle Step.

This step offers great advancement over the old style. Containing a reservoir for oil, it needs oiling but twice a year.

By holes drilled through partitions between reservoir and bearing, oil enters bottom of bearing, and is siphoned back into the reservoir through the top; hence the only loss of oil being by wearing out and evaporation, which is very slight.

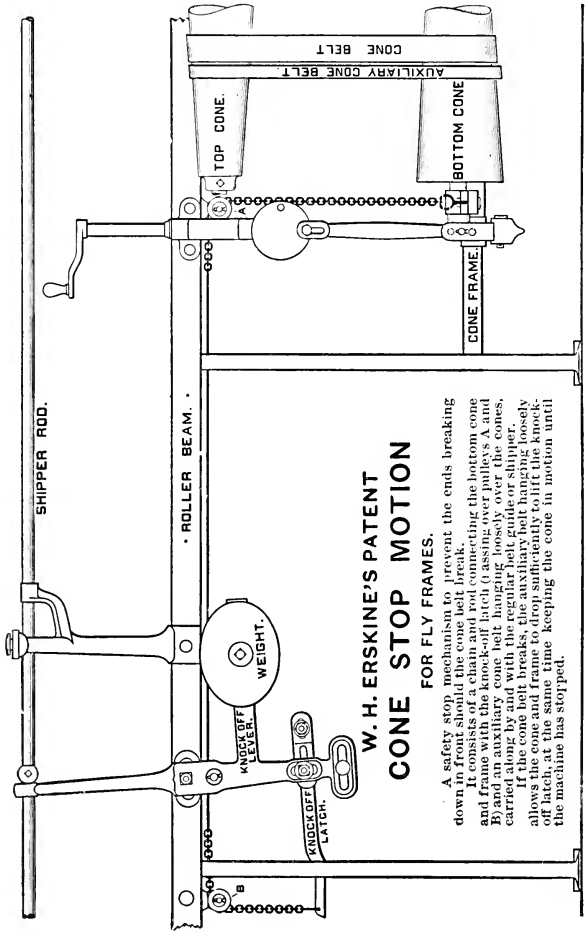
Another important feature is, owing to the quantity of oil we are able to keep constantly in bearing and reservoir, the bottom of spindle is never without a cushion, which positively guarantees a steady-running spindle, thus overcoming the unsteadiness so often noticed in many of the mills in this country.

The large plug in back of reservoir is to admit of its being cleaned out should the oil become thick from long usage.

Figure 1 represents spindle as it appears when running, and Figure 2 represents spindle raised as it should be when filling reservoir with oil.

Notice new hook, which prevents unstepping of spindle in doffing, also damage to casings.

Woonsocket Roving Machinery, Continued.



W. H. ERSKINE'S PATENT
CONE STOP MOTION
FOR FLY FRAMES.

A safety stop mechanism to prevent the ends breaking down in front should the cone belt break.

It consists of a chain and rod connecting the bottom cone and frame with the knock-off latch (passing over pulleys A and B) and an auxiliary cone belt hanging loosely over the cones, carried along by and with the regular belt guide or shipper.

If the cone belt breaks, the auxiliary belt hanging loosely allows the cone and frame to drop sufficiently to lift the knock-off latch, at the same time keeping the cone in motion until the machine has stopped.

Woonsocket Roving Machinery, Continued.

The Leon W. Campbell Ball Bearing Top Roll.

This roll is adapted to railway heads, drawing frames, slubbing, intermediate, roving, and jack frames.

Less weight can be used with it than with any other type of roll, because there is practically no friction to overcome, the roll starting the instant the steel roll revolves.

Advantages of this roll :

(1). It runs with a small amount of oil.

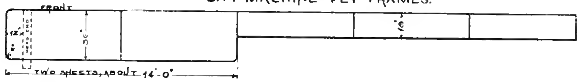
(2). The oil can not damage the leather covers, nor can it get on the sliver or roving.

(3). There is less friction than with any other type of roll.

(4). Saves wear of both leather and fluted rolls.

(5). Will run absolutely steady, and thereby produces stronger and more even yarn.

DIMENSIONS OF ZINC FOR "CITY MACHINE" FLY FRAMES.



RULE, TO FIND TOTAL LENGTH OF ZINC. MULTIPLY ONE HALF THE NUMBER OF SPINDLES BY THE SPACE, AND ADD FOUR FEET.

Woonsocket Roving Machinery, Continued.

Sizes of Frames, Speeds, Etc.

Frame	Size of Bobbin Inches	Gauge Inches	No. of Spindles to Roll	Mini'um No. of Spindles to Frame	Revolutions		Dia. Pulley for 2-in. Belt Inches	Weight of Cotton on Bobbin, Oz.	Width of Frame
					Flyer	Pulley			
Slubber	12 x 6	10	4	24	660	344	16	46	3 ft. 6 in.
"	11 x 5½	9	4	28	750	391	16	33	3 ft. 6 in.
"	10 x 5	9	4	32	800	392	16	27	3 ft. 3 in.
Intermediate ...	10 x 5	7½	6	42	900	441	16	27	3 ft. 3 in.
" ...	9 x 4½	6½	6	48	1000	490	16	21	3 ft. 3 in.
" ...	8 x 4	6	8	48	1150	441	16	16	3 ft. 0 in.
Roving Frame..	8 x 3½	5¼	8	56	1200	460	16	14	3 ft. 0 in.
" " ..	7 x 3½	5¼	8	64	1300	423	16	10½	2 ft. 11 in.
" " ..	7 x 3	4½	8	72	1350	439	16	8½	2 ft. 11 in.
Jack Frame	6 x 3	4½	8	80	1400	456	16	6½	2 ft. 11 in.
" "	6 x 2½	4¼	8	88	1600	524	16	5½	2 ft. 11 in.
" "	5 x 2½	4¼	8	96	1700	556	16	4	2 ft. 11 in.

1⅛-inch front Rolls are used on frames up to 8 inches x 4 inches inclusive.

1¼-inch front Rolls are used on frames above 9 inches x 4½ inches inclusive.

Belts. — Pulleys furnished for 2-inch belts on all frames.

Number of Spindles to the Frame. — In deciding on exact number of spindles wanted for each frame, bear in mind that it must be exactly divisible by the "number of spindles to the roll," taken from the proper column in the foregoing table; for example, a 96 spindle Intermediate, 8 inches x 4 inches bobbin is all right, for it is exactly divisible by 8 (the number of spindles to roll, taken from above table).

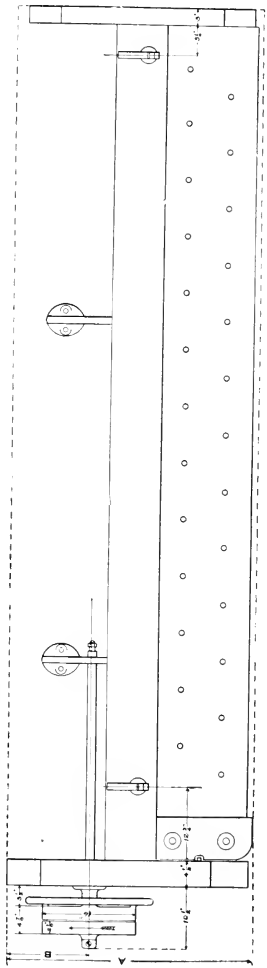
Length of Frame. — Multiply one-half the number of spindles to the Frame by the gauge, and add 36 inches. For example, the length of an Intermediate, 8 inches x 4 inches, 6-inch gauge, 96 spindles, is found to be $96 \div 2 \times 6 + 36 = 324$ inches, or 27 feet.

"Horse Power Required"—See Index.

Woonsocket Roving Machinery, Continued.

Table of Dimensions.

Size of Frame	A.	B.	Floor to Center of Shaft.
11" and 12"	3'-6"	14"	26½"
9" and 10"	3'-3"	13"	24¾"
8"	3'-1"	12¾"	20½"
5", 6" and 7"	3'-0"	11¾"	20"



Floor Plan for all Frames.

Woonsocket Roving Machinery, Continued.

Constant Table
(With Daly Differential.)

Frame	Size Bobbin Inches	Gauge Inches	Twist Constant	Draft Constant	Lay Constant	Contact Constant
Slubber	12 x 6	10	32.689	175.	20.0232	34.1136
"	11 x 5½	9	32.689	175.	20.0232	34.1136
"	10 x 5	9	28.994	175.	17.0748	27.5094
Intermediate	10 x 5	7½	40.59	175.	25.2861	33.7148
"	9 x 4½	6½	40.59	175.	25.2861	33.7148
"	8 x 4	6	50.337	180.	29.6982	45.2544
Roving Frame	8 x 3½	5¼	71.19	180.	44.72	67.08
" "	7 x 3½	5¼	71.19	180.	44.72	67.08
" "	7 x 3	4½	71.19	180.	44.72	67.08
Jack Frame	6 x 3	4½	71.19	180.	49.7494	86.2316
" "	6 x 2½	4¼	146.918	180.	79.196	141.42
" "	5 x 2½	4¼	146.918	180.	79.196	141.42

TO FIND THE TWIST CONSTANT:

Divide the product of the number of teeth in the driving gears (from the spindle to the front roll) by the product of the number of teeth in the driven gears, omitting the twist gear, and divide the quotient by the circumference of the front roll.

Example.—What is the twist constant of a 12″×6″ slubbing frame?

$(46 \times 42 \times 48 \times 120) \div (24 \times 42 \times 86) \div 3.927 = 32.689.$ *Ans.*

TO FIND THE DRAUGHT CONSTANT:

Divide the product of the circumference of the front roll and driving gears (from front to back roll) by the product of the number of teeth in the driven gears, omitting the draught gear, and divide quotient by the circumference of the back roll.

Example.—What is the draught constant of a 12″ × 6″ slubbing frame?

$(3.927 \times 100 \times 56) \div (40) \div 3.1416 = 175.$ *Ans.*

Woonsocket Roving Machinery, Continued.

TO FIND THE LAY CONSTANT:

Multiply the square root of the number of roving you are making by the number of teeth in your lay gear.

Example.—What is my lay constant if I am using a 44-tooth lay gear in making .20 hank roving?

$\sqrt{.20} \times 44 = 19.6768.$ *Ans.*

TO FIND CONTACT CONSTANT:

Multiply the square root of the number of roving you are making by the number of teeth in your contact or tension gear.

Example.—What is my contact constant if I am using a 67-tooth contact gear in making .20 hank roving?

$\sqrt{.20} \times 67 = 29.9624.$ *Ans.*

TO FIND TWIST CHANGE GEAR:

Divide twist constant by twist per inch required = number of teeth in twist gear.

TO FIND DRAUGHT CHANGE GEAR:

Divide draft constant by draft required = number of teeth in draft gear.

TO FIND LAY CHANGE GEAR:

Divide lay constant by the square root of the number of roving required = number of teeth in lay gear.

TO FIND CONTACT CHANGE GEAR:

Divide contact constant by the square root of the number of roving required = number of teeth in contact gear:

GEARING TABLES AND DIAGRAMS.

The following tables and diagrams are for our standard frames only, and do not apply where special gearing has been required.

Woonsocket Roving Machinery, Continued.

Slubbers.

(Production for 10 hours, allowing 15 minutes per set for stoppages.)

Size of Bobbin Inches	Gauge Inches	Number of Roving	Twist Per Inch	Revolutions of Front Roll	Sets Per Day	Hanks Per Day Per Spindle	Pounds Per Day Per Spindle	Twist Gear	Contact Gear	Lay Gear	Cone Gear	Draft	Draft Gear
12 x 6	10	.20	.54	308	20.42	11.74	58.71	60	76	45	33	4.60	38
		.30	.66	251	14.47	12.48	41.60	49	62	37	33	4.73	37
		.40	.76	220	10.85	12.47	31.19	43	54	32	33	4.86	36
		.50	.85	195	8.36	12 01	24.03	38	48	28	33	5.00	35
		.60	.93	179	6.72	11.59	19.32	35	44	26	33	5.15	34
		.70	1.00	164	5.48	11.02	15.75	32	41	24	33	5.30	33
		.80	1.07	154	4.61	10.60	13.25	30	38	22	33	5.47	32
		.90	1.14	144	3.91	10.11	11.24	28	36	21	33	5.64	31
		1.00	1.20	138	3.42	9.83	9.83	27	34	20	33	5.83	30
11 x 5½	9	.30	.66	286	18.95	11.73	39.09	49	62	37	33	4.60	38
		.40	.76	251	14.88	12.27	30.69	43	54	32	33	4.73	37
		.50	.85	221	11.78	12.14	24.29	38	48	28	33	4.86	36
		.60	.93	204	9.72	12.03	20.05	35	44	26	33	5.00	35
		.70	1.00	187	8.05	11.62	16.60	32	41	24	33	5.15	34
		.80	1.07	175	6.85	11.30	14.13	30	38	22	33	5.30	33
		.90	1.14	163	5.84	10.83	12.04	28	36	21	33	5.47	32
		1.00	1.20	157	5.16	10.64	10.64	27	34	20	33	5.64	31
		1.10	1 26	152	4.62	9.53	10.48	26	33	19	33	5.83	30
10 x 5	9	.40	.76	267	17 40	11.74	29.36	38	43	27	40	4.73	37
		.50	.85	239	14.22	11.99	23.99	34	39	24	40	4.86	36
		.60	.93	218	11.82	11.97	19.95	31	36	22	40	5.00	35
		.70	1.00	203	10.03	11.84	16.92	29	33	20	40	5.15	34
		.80	1.07	189	8.57	11.57	14.46	27	31	19	40	5.30	33
		.90	1.14	175	7.33	11.12	12.36	25	29	18	40	5.47	32
		1.00	1.20	168	6.50	10.97	10.97	24	27	17	40	5.64	31
		1.10	1.26	161	5.78	10.72	9.75	23	26	16	40	5.83	30
		1.20	1.31	154	5.16	10.44	8.70	22	25	15	40	6.03	29

Woonsocket Roving Machinery, Continued.

Intermediates.

(Production for 10 hours, allowing 15 minutes per set for stoppages.)

Size of Bobbin Inches	Gauge Inches	Number of Roving	Twist Per Inch	Revolutions of Front Roll	Sets Per Day	Hanks Per Day Per Spindle	Pounds Per Day Per Spindle	Twist Gear	Contact Gear	Lay Gear	Cone Gear	Draft	Draft Gear
10 x 5	7½	.80	1.07	214	9.44	12.74	15.93	38	38	28	40	4.60	38
		.90	1.14	197	8.06	12.24	13.60	35	36	27	40	4.73	37
		1.00	1.20	192	7.25	12.23	12.23	34	34	25	40	4.86	36
		1.10	1.26	180	6.35	11.78	10.71	32	32	24	40	5.00	35
		1.20	1.31	175	5.76	11.66	9.72	31	31	23	40	5.15	34
		1.30	1.37	163	5.05	11.07	8.52	29	30	22	40	5.30	33
		1.40	1.42	158	4.61	10.89	7.78	28	29	21	40	5.47	32
		1.50	1.47	152	4.19	10.40	7.07	27	28	21	40	5.64	31
		1.60	1.52	147	3.83	10.33	6.46	26	27	20	40	5.83	30
9 x 4½	6½	.90	1.14	219	10.61	12.52	13.92	35	36	27	40	4.60	38
		1.00	1.20	207	9.40	12.33	12.33	33	34	25	40	4.73	37
		1.10	1.26	200	8.50	12.26	11.15	32	32	24	40	4.86	36
		1.20	1.31	194	7.74	12.19	10.16	31	31	23	40	5.10	35
		1.30	1.37	182	6.88	11.73	9.03	29	30	22	40	5.15	34
		1.40	1.42	175	6.26	11.49	8.21	28	29	21	40	5.30	33
		1.50	1.47	169	5.73	11.28	7.52	27	28	21	40	5.47	32
		1.60	1.52	163	5.25	11.02	6.89	26	27	20	40	5.64	31
		1.70	1.56	163	4.98	10.04	5.91	26	26	19	40	5.83	30
8 x 4	6	1.00	1.20	271	12.88	12.88	12.88	42	45	30	31	4.50	40
		1.25	1.34	239	10.04	12.55	10.04	37	40	27	31	4.62	39
		1.50	1.47	219	8.15	12.22	8.15	34	37	24	31	4.74	38
		1.75	1.58	207	6.87	12.02	6.87	32	34	22	31	4.86	37
		2.00	1.70	187	5.63	11.26	5.63	29	32	21	31	5.00	36
		2.25	1.80	181	4.94	11.11	4.94	28	30	20	31	5.14	35
		2.50	1.89	168	4.21	10.52	4.21	26	29	19	31	5.29	34
		2.75	1.98	161	3.72	10.23	3.72	25	27	18	31	5.45	33
		3.00	2.08	155	3.32	9.96	3.32	24	26	17	31	5.62	32

Woonsocket Roving Machinery, Continued.

Roving Frames.

(Production for 10 hours, allowing 15 minutes per set for stoppages.)

Size of Bobbin Inches	Gauge Inches	Number of Roving	Twist Per Inch	Revolutions of Front Roll	Sets Per Day	Hanks Per Day Per Spindle	Pounds Per Day Per Spindle	Twist Gear	Contact Gear	Lay Gear	Cone Gear	Draft	Draft Gear
		1.50	1.47	230	9.40	12.33	8.22	39	32	29	30	4.50	40
		2.00	1.70	196	6.56	11.48	5.74	37	34	28	30	4.62	39
		2.50	1.89	179	5.02	10.97	4.39	34	36	27	30	4.74	38
		3.00	2.08	163	3.92	10.29	3.43	32	39	26	30	4.86	37
8 x 3½	5¼	3.50	2.24	151	3.18	9.73	2.78	29	36	24	30	5.00	36
		4.00	2.40	140	2.62	9.16	2.29	28	34	22	30	5.14	35
		4.50	2.54	135	2.26	8.91	1.98	26	32	21	30	5.29	34
		5.00	2.68	123	1.87	8.15	1.63	25	30	20	30	5.45	33
		5.50	2.81	117	1.63	7.81	1.42	24	29	19	30	5.62	32
		2.00	1.70	216	8.95	11.74	5.87	42	47	32	30	4.50	40
		2.50	1.89	191	6.78	11.12	4.45	37	42	28	30	4.62	39
		3.00	2.08	175	5.39	10.62	3.54	34	39	26	30	4.74	38
		3.50	2.24	165	4.47	10.25	2.93	32	36	24	30	4.86	37
7 x 3½	5¼	4.00	2.40	150	3.64	9.56	2.39	29	34	22	30	5.00	36
		4.50	2.54	144	3.15	9.31	2.07	28	32	21	30	5.14	35
		5.00	2.68	134	2.67	8.7	1.75	26	30	20	30	5.29	34
		5.50	2.81	129	2.35	8.47	1.54	25	29	19	30	5.45	33
		6.00	2.94	124	2.09	8.22	1.37	24	27	18	30	5.62	32
		4.00	2.40	155	4.53	9.60	2.40	29	34	22	30	4.50	40
		4.50	2.54	150	3.96	9.45	2.10	28	32	21	30	4.62	39
		5.00	2.68	139	3.36	8.90	1.78	26	30	20	30	4.74	38
		5.50	2.81	134	2.97	8.69	1.58	25	29	19	30	4.86	37
7 x 3	4½	6.00	2.94	128	2.63	8.40	1.40	24	27	18	30	5.00	36
		6.50	3.06	123	2.35	8.12	1.25	23	26	18	30	5.14	35
		7.00	3.17	117	2.09	7.77	1.11	22	25	17	30	5.29	34
		7.50	3.29	112	1.87	7.43	.993	21	25	16	30	5.45	33
		8.00	3.39	112	1.76	7.48	.935	21	23	16	30	5.62	32

Roving finer than given in table can be made on the frames. For good economy it is not advisable.

Woonsocket Roving Machinery, Continued.

Jack Frames.

(Production for 10 hours, allowing 15 minutes per set for stoppages.)

Size of Bobbin Inches	Gauge Inches	Number of Roving	Twist Per Inch	Revolutions of Front Roll	Sets Per Day	Hanks Per Day Per Spindle	Pounds Per Day Per Spindle	Twist Gear	Contact Gear	Lay Gear	Cone Gear	Draft	Draft Gear
6 x 3	4½	3.00	2.08	189	7.63	10.71	3.57	34	50	29	36	4.50	40
		4.00	2.40	161	5.23	9.80	2.45	29	43	25	36	4.62	39
		5.00	2.68	145	3.91	9.15	1.83	26	39	22	36	4.74	38
		6.00	2.94	133	3.06	8.58	1.43	24	35	20	36	4.86	37
		7.00	3.17	122	2.45	8.05	1.15	22	32	19	36	5.00	36
		8.00	3.39	116	2.06	7.72	.965	21	30	18	36	5.14	35
		9.00	3.60	106	1.68	7.09	.787	19	29	17	35	5.29	34
		10.00	3.79	100	1.44	6.75	.675	18	27	16	36	5.45	33
		11.00	3.98	100	1.31	6.75	.614	18	26	15	36	5.62	32
6 x 2½	4¼	8.00	3.39	132	3.10	8.48	1.06	43	50	28	36	4.50	40
		9.00	3.60	126	2.66	8.19	.914	41	47	26	36	4.62	39
		10.00	3.79	120	2.30	7.90	.790	39	45	25	36	4.74	38
		11.00	3.98	114	2.00	7.55	.687	37	43	24	36	4.86	37
		12.00	4.16	108	1.75	7.20	.600	35	41	23	36	5.00	36
		13.00	4.33	105	1.58	7.06	.543	34	39	22	36	5.14	35
		14.00	4.49	99	1.39	6.68	.477	32	38	21	36	5.29	34
		15.00	4.64	95	1.25	6.43	.429	31	36	20	36	5.45	33
		16.00	4.80	92	1.13	6.21	.388	30	35	20	36	5.62	32
5 x 2½	4¼	10.00	3.79	128	3.29	8.22	.822	39	45	25	36	4.50	40
		12.00	4.16	114	2.49	7.46	.622	35	41	23	36	4.62	39
		14.00	4.49	105	1.99	6.95	.497	32	38	21	36	4.74	38
		16.00	4.80	98	1.64	6.56	.410	30	35	20	36	4.86	37
		18.00	5.09	95	1.42	6.39	.355	29	33	19	36	5.00	36
		20.00	5.37	88	1.19	5.94	.297	27	32	18	36	5.14	35
		22.00	5.63	85	1.08	5.76	.262	26	30	17	36	5.29	34
		24.00	5.88	82	.935	5.59	.233	25	29	16	36	5.45	33
		26.00	6.12	78	.824	5.35	.206	24	28	16	36	5.62	22

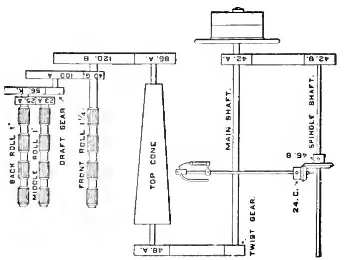
6 x 3 Frames can be specially geared for fine roving. We would not advise it.

6 x 2½ Frames will run roving as fine as the 5 x 2½ and its use is advised on as fine work as number 26s; change gearing same as 5 x 2½ frame.

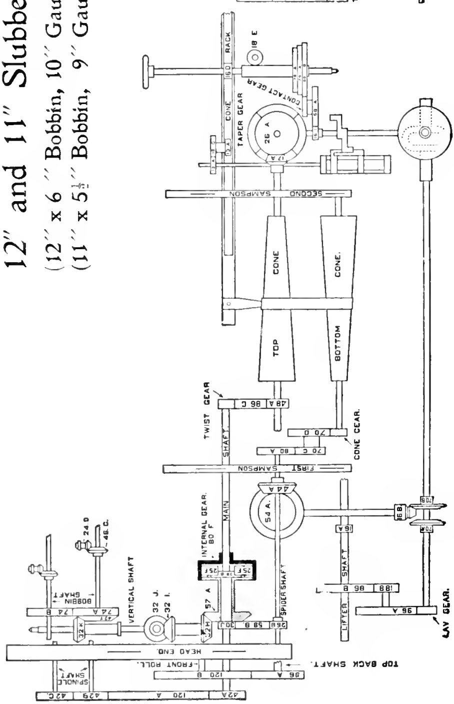
Woonsocket Roving Machinery, Continued.

12" and 11" Slubbers.

(12" x 6" Bobbin, 10" Gauge.)
(11" x 5½" Bobbin, 9" Gauge.)



Draught and Twist Diagram.



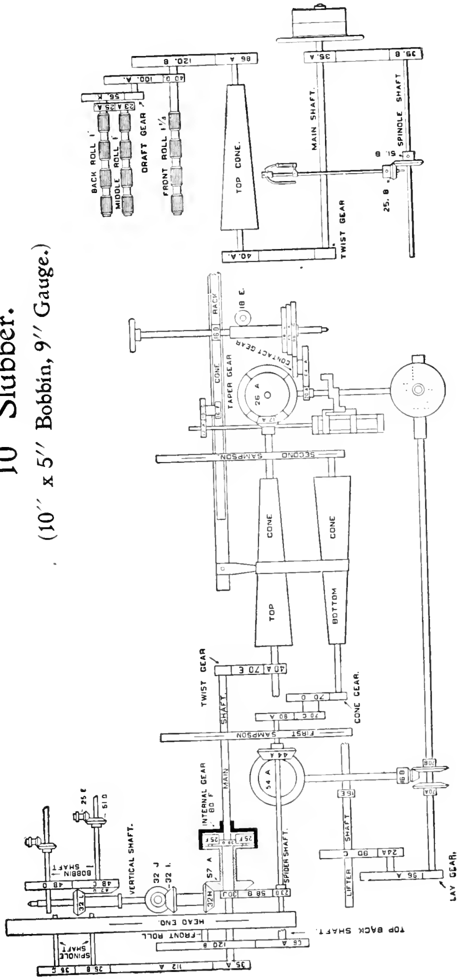
General Gearing Diagram.

(With Daly Differential.)

Woonsocket Roving Machinery, Continued.

10 Slubber.

(10" x 5" Bobbin, 9" Gauge.)



Draught and Twist Diagram.

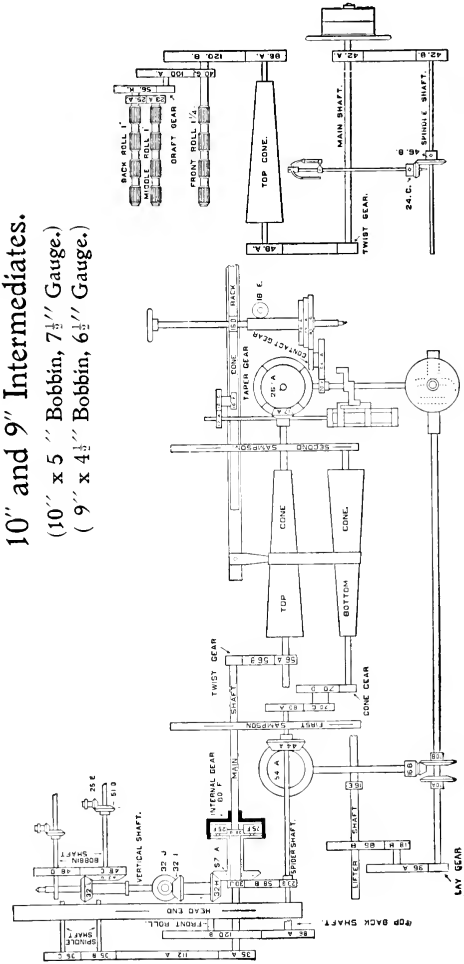
(With Daly Differential.)

General Gearing Diagram.

Woonsocket Roving Machinery, Continued.

10" and 9" Intermediates.

(10" x 5" Bobbin, 7½" Gauge.)
(9" x 4½" Bobbin, 6½" Gauge.)



Draught and Twist Diagram.

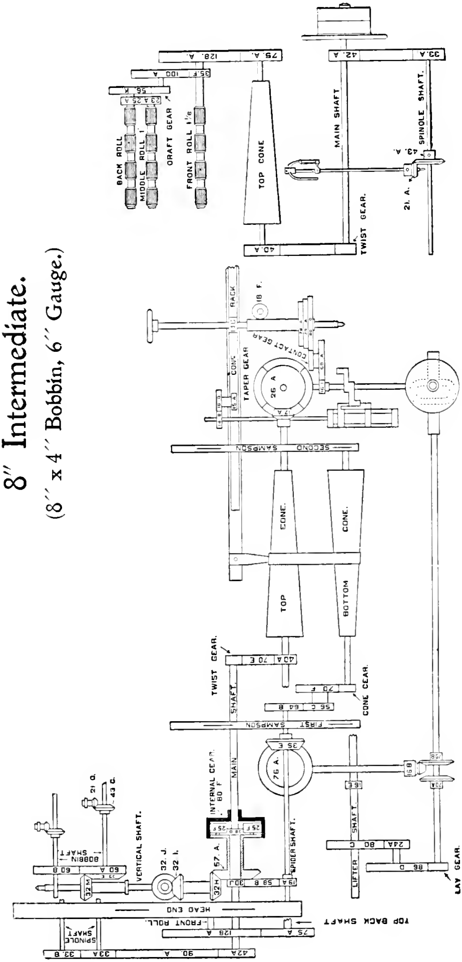
(With Daly Differential.)

General Gearing Diagram.

Woonsocket Roving Machinery, Continued.

8" Intermediate.

(8" x 4" Bobbin, 6" Gauge.)



Draught and Twist Diagram.

(With Daly Differential.)

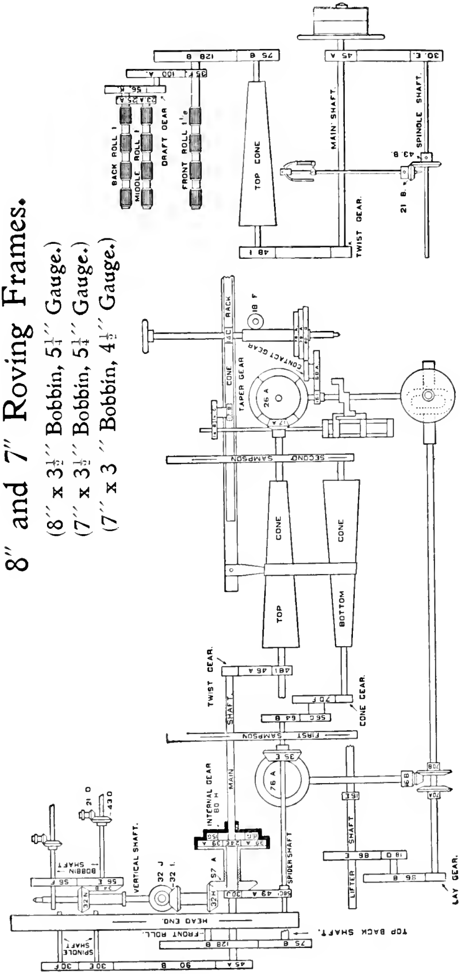
General Gearing Diagram.

Woonsocket Roving Machinery, Continued.

8" and 7" Roving Frames.

(8" x 3½" Bobbin, 5¼" Gauge.)
(7" x 3½" Bobbin, 5¼" Gauge.)
(7" x 3 " Bobbin, 4½" Gauge.)

(With Daly Differential.)



Draught and Twist Diagram.

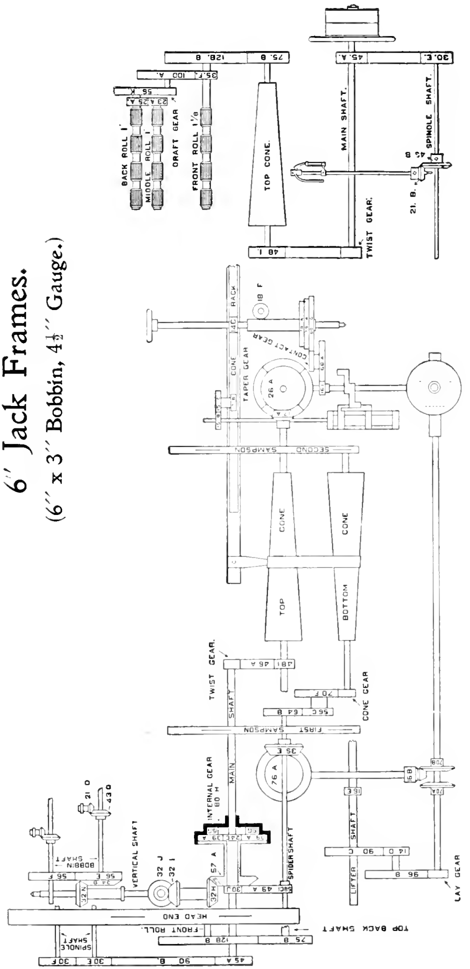
General Gearing Diagram.

Woonsocket Roving Machinery, Continued.

6" Jack Frames.

(6" x 3" Bobbin, 4½" Gauge.)

(With Daly Differential.)



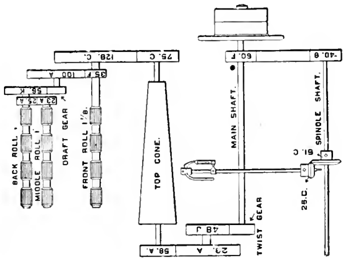
Draught and Twist Diagram.

General Gearing Diagram.

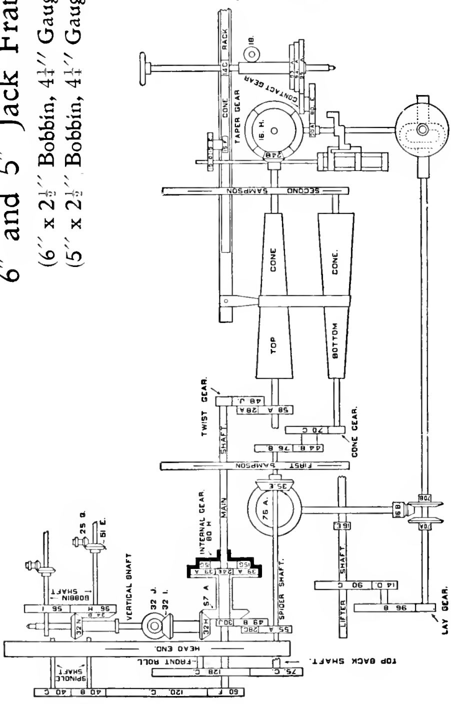
Woonsocket Roving Machinery, Continued.

6" and 5" Jack Frames.

(6" x $2\frac{1}{2}$" Bobbin, $4\frac{1}{4}$" Gauge.)
(5" x $2\frac{1}{2}$" Bobbin, $4\frac{1}{4}$" Gauge.)



Draught and Twist Diagram.



(With Daly Differential)

General Gearing Diagram.

Woonsocket Roving Machinery, Continued.

Roving Table.

For Numbering by the Weight, in Grains, of 12 Yards; and showing Twist per Inch.

Grains Weight.	Hank Roving.	Square Root.	Twist per Inch	Grains Weight.	Hank Roving.	Square Root.	Twist per Inch
400.00	.25	.500	.60	147.06	.68	.825	.99
384.61	.26	.510	.61	144.93	.69	.831	1.00
370.37	.27	.520	.62	142.86	.70	.837	1.00
357.14	.28	.529	.63	140.85	.71	.843	1.01
344.83	.29	.539	.65	138.89	.72	.849	1.02
333.33	.30	.548	.66	135.99	.73	.854	1.02
322.58	.31	.557	.67	135.14	.74	.860	1·03
312.50	.32	.566	.68	133.33	.75	.866	1.04
303.03	.33	.574	.69	131.58	.76	.872	1.05
294.12	.34	.583	.70	129.87	.77	.874	1.05
285.71	.35	.592	.71	128.21	.78	.883	1.06
277.78	.36	.600	.72	126.58	.79	.889	1.07
270.27	.37	.608	.73	125.00	.80	.894	1.07
263.16	.38	.616	.74	123.46	.81	.900	1.08
256.41	.39	.624	.75	121.95	.82	.906	1.09
250.00	.40	.632	.76	120.48	.83	.911	1.09
243.90	.41	.640	.77	119.05	.84	.917	1.10
238.10	.42	.648	.78	117.65	.85	.922	1.11
232.56	.43	.656	.79	116.28	.86	.927	1.11
227.27	.44	.663	.80	114.94	.87	.933	1.12
222.22	.45	.671	.80	113.64	.88	.938	1.13
217.39	.46	.678	.81	112.36	.89	.943	1.13
212.77	.47	.686	.82	111.11	.90	.949	1.14
208.33	.48	.693	.83	109.89	.91	.954	1.14
204.08	.49	.700	.84	108.70	.92	.959	1.15
200.00	.50	.707	.85	107.53	.93	.964	1.16
196.08	.51	.714	.86	106.38	.94	.970	1.16
192.31	.52	.721	.87	105.26	.95	.975	1.17
188.68	.53	.728	.87	104.17	.96	.980	1.18
185.19	.54	.735	.88	103.09	.97	.985	1.18
181.82	.55	.742	.89	102.04	.98	.990	1.19
178.57	.56	.748	.90	101.01	.99	.995	1.19
175.44	.57	.755	.91	100.00	1.00	1.000	1.20
172.41	.58	.762	.91	98.04	1.02	1.010	1.21
169.49	.59	.768	.92	96.15	1.04	1.020	1.22
166.67	.60	.775	.93	94.34	1.06	1.030	1.24
163.93	.61	.781	.94	92.59	1.08	1.039	1.25
161.29	.62	.787	.94	90.91	1.10	1.049	1.26
158.73	.63	.794	.95	89.29	1.12	1.058	1.27
156.25	.64	.800	.96	87.72	1.14	1.068	1.28
153.85	.65	.806	.97	86.21	1.16	1.077	1.29
151.52	.66	.812	.97	84.75	1.18	1.086	1.30
149.25	.67	.819	.98	83.33	1.20	1.095	1.31

Twist = 1.2 × square root.

Woonsocket Roving Machinery, Continued.

Roving Table. Continued.

For Numbering by the Weight, in Grains, of 12 Yards; and showing Twist per Inch.

Grains Weight.	Hank Roving.	Square Root.	Twist per Inch	Grains Weight.	Hank Roving.	Square Root.	Twist per Inch
81.97	1.22	1.105	1.33	48.08	2.08	1.442	1.73
80.65	1.24	1.114	1.34	47.62	2.10	1.449	1.74
79.37	1.26	1.122	1.35	47.17	2.12	1.456	1.75
78.12	1.28	1.131	1.36	46.73	2.14	1.463	1.76
76.92	1.30	1.140	1.37	46.30	2.16	1.470	1.76
75.76	1.32	1.149	1.38	45.87	2.18	1.476	1.77
74.63	1.34	1.158	1.39	45.45	2.20	1.483	1.78
73.53	1.36	1.166	1.40	45.05	2.22	1.490	1.79
72.46	1.38	1.175	1.41	44.64	2.24	1.497	1.80
71.43	1.40	1.183	1.42	44.25	2.26	1.503	1.80
70.42	1.42	1.192	1.43	43.86	2.28	1.510	1.81
69.44	1.44	1.200	1.44	43.48	2.30	1.517	1.82
68.49	1.46	1.208	1.45	43.10	2.32	1.523	1.83
67.57	1.48	1.217	1.46	42.74	2.34	1.530	1.84
66.67	1.50	1.225	1.47	42.37	2.36	1.536	1.84
65.79	1.52	1.233	1.48	42.02	2.38	1.543	1.85
64.94	1.54	1.241	1.49	41.67	2.40	1.549	1.86
64.10	1.56	1.249	1.50	41.32	2.42	1.556	1.87
63.29	1.58	1.257	1.51	40.98	2.44	1.562	1.87
62.50	1.60	1.265	1.52	40.65	2.46	1.568	1.88
61.73	1.62	1.273	1.53	40.32	2.48	1.575	1.89
60.98	1.64	1.281	1.54	40.00	2.50	1.581	1.90
60.24	1.66	1.288	1.55	39.68	2.52	1.587	1.90
59.52	1.68	1.296	1.56	39.37	2.54	1.594	1.91
58.82	1.70	1.304	1.56	39.06	2.56	1.600	1.92
58.14	1.72	1.311	1.57	38.76	2.58	1.606	1.93
57.47	1.74	1.319	1.58	38.46	2.60	1.612	1.93
56.82	1.76	1.327	1.59	38.17	2.62	1.619	1.94
56.18	1·78	1.334	1.60	37.88	2.64	1.625	1.95
55.56	1.80	1.342	1.61	37.59	2.66	1.631	1.96
54.95	1.82	1.349	1.62	37.31	2.68	1.637	1.96
54.35	1.84	1.356	1.63	37.04	2.70	1.643	1.97
53.76	1.86	1.364	1.64	36.76	2.72	1.649	1.98
53.19	1.88	1.371	1.65	36.50	2.74	1.655	1.99
52.63	1.90	1.378	1.65	36.23	2.76	1.661	1.99
52.08	1.92	1.386	1.66	35.97	2.78	1.667	2.00
51.55	1.94	1.393	1.67	35.71	2.80	1.673	2.01
51.02	1.96	1.400	1.68	35.46	2.82	1.679	2.01
50.51	1.98	1.407	1.69	35.21	2.84	1.685	2.02
50.00	2.00	1.414	1.70	34.97	2.86	1.691	2.03
49.50	2.02	1·421	1.71	34.72	2.88	1.697	2.04
49.02	2.04	1.428	1.71	34.48	2.90	1.703	2.04
48.54	2.06	1.435	1.72	34 25	2.92	1 709	2.05

Twist = 1.2 × square root.

Woonsocket Roving Machinery, Concluded.

Roving Table. Continued.

For Numbering by the Weight, in Grains, of 12 Yards; and showing Twist per Inch.

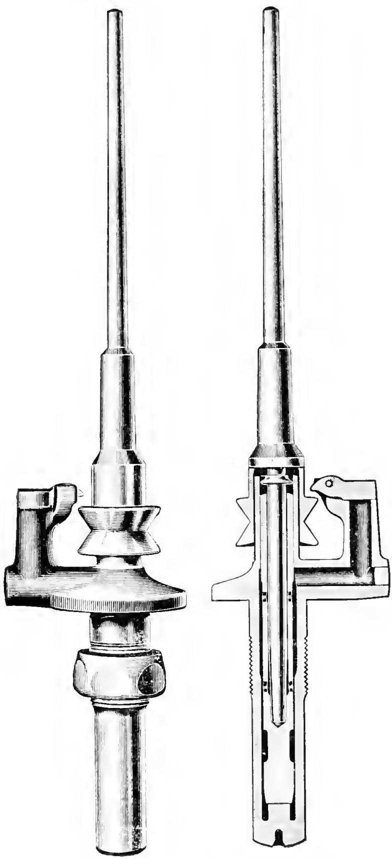
Grains Weight.	Hank Roving.	Square Root.	Twist per Inch	Grains Weight.	Hank Roving.	Square Root.	Twist per Inch
34.01	2.94	1.715	2.06	14.29	7.00	2.646	3.17
33.78	2.96	1.721	2.07	14.08	7.10	2.665	3.20
33.56	2.98	1.726	2.07	13.89	7.20	2.683	3.22
33.33	3.00	1.732	2.08	13.70	7.30	2.702	3.24
32.26	3.10	1.761	2.11	13.51	7.40	2.720	3.26
31.25	3.20	1.789	2.15	13.33	7.50	2.739	3.29
30.30	3.30	1.817	2.18	13.16	7.60	2.757	3.31
29.41	3.40	1.844	2.21	12.99	7.70	2.775	3.33
28.57	3.50	1.871	2.24	12.82	7.80	2.793	3.35
27.78	3.60	1.897	2.28	12.66	7.90	2.811	3.37
27.03	3.70	1.924	2.31	12.50	8.00	2.828	3.39
26.32	3.80	1.949	2.34	12.35	8.10	2.846	3.42
25.64	3.90	1.975	2.37	12.20	8.20	2.864	3.44
25.00	4.00	2.000	2.40	12.05	8.30	2.881	3.46
24.39	4.10	2.025	2.43	11.90	8.40	2.898	3.48
23.81	4.20	2.049	2.46	11.76	8.50	2.915	3.50
23.26	4.30	2.074	2.49	11.63	8.60	2.933	3.52
22.73	4.40	2.098	2.52	11.49	8.70	2.950	3.54
22.22	4.50	2.121	2.55	11.36	8.80	2.966	3.56
21.74	4.60	2.145	2.57	11.24	8.90	2.983	3.58
21.28	4.70	2.168	2.60	11.11	9.00	3.000	3.60
20.83	4.80	2.191	2.63	10.99	9.10	3.017	3.62
20.41	4.90	2.214	2.66	10.87	9.20	3.033	3.64
20.00	5.00	2.236	2.68	10.75	9.30	3.050	3.66
19.61	5.10	2.258	2.71	10.64	9.40	3.066	3.68
19.23	5.20	2.280	2.74	10.53	9.50	3.082	3.70
18.87	5.30	2.302	2.76	10.42	9.60	3.098	3.72
18.52	5.40	2.324	2.79	10.31	9.70	3.114	3.74
18.18	5.50	2.345	2.81	10.20	9.80	3.130	3.76
17.86	5.60	2.366	2.84	10.10	9.90	3.146	3.78
17.54	5.70	2.387	2.86	10.00	10.00	3.162	3.79
17.24	5.80	2.408	2.89	9.09	11.00	3.317	3.98
16.95	5.90	2.429	2.91	8.33	12.00	3.464	4.16
16.67	6.00	2.449	2.94	7.69	13.00	3.606	4.33
16.39	6.10	2.470	2.96	7.14	14.00	3.742	4.49
16.13	6.20	2.490	2.99	6.67	15.00	3.873	4.65
15.87	6.30	2.510	3.01	6.25	16.00	4.000	4.80
15.62	6.40	2.530	3.04	5.88	17.00	4.123	4.95
15.38	6.50	2.550	3.06	5.56	18.00	4.243	5.09
15.15	6.60	2.569	3.08	5.26	19.00	4.359	5.23
14.93	6.70	2.588	3.11	5.00	20.00	4.472	5.37
14.71	6.80	2.608	3.13	4.76	21.00	4.582	5.50
14.49	6.90	2.627	3.15	4.27	22.00	4.690	5.63

Twist=1.2 × square root.

WHITIN GRAVITY SPINDLES.

Over 3,000,000 Gravity Spindles are now in use in many of the best mills in the country, a fact which attests their practical utility, and the high degree of favor they have received from manufacturers. The reputation this spindle has acquired is based largely upon the fact that it is simple in construction and durable. Some of the spindles have been run at a speed of 12,000 turns a minute for several years without any perceptible evidence of wear. The whole structure of bolster, spindle, bobbin, and its yarn load rests upon a solid pin milled into the bottom of the bolster case. To prevent the escapement of oil which the high speed of the spindles naturally forces out under the whirl, a small ring, extending down a short distance into the bolster, is driven onto the spindle under the whirl. When starting up new spindles the oil chamber and tube should be completely filled, and afterwards, in order to get the best results, a little fresh oil should be added every week. An examination of the accompanying cut shows that the oil is admitted to spindle bearings through two small ducts. Thus the main supply of oil is not agitated by the motion of the spindle, and all dirt settles at bottom of the bolster case. The spindle is ordinarily built to drive the bobbin from a cone at the base of the spindle blade, and by this method of driving, the interior of the bobbin is not materially cut away, and its strength is maintained. The same spindle can be used for either warp or filling yarn, a convenience which will be appreciated by those whose work calls for frequent changes. The superiority

Whitin Gravity Spindles, Continued.



Whitin Gravity Spindle.

Whitin Gravity Spindles, Continued.

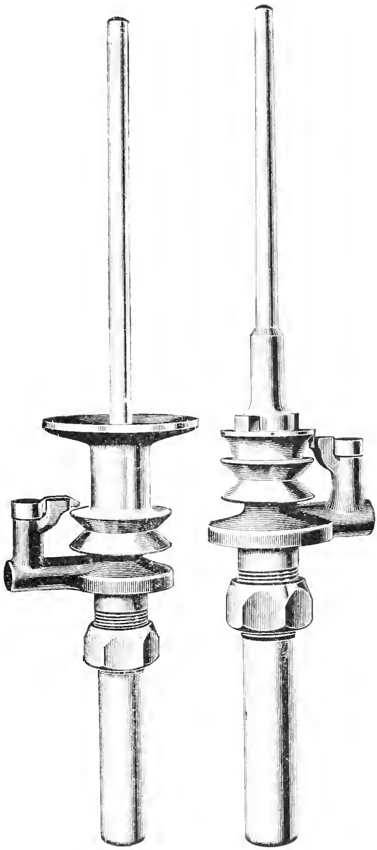
of the Gravity Spindle in running is largely due to the arrangement of the parts of the bolster and its case opposite the center of the whirl. A sliding fit between the interior and exterior cylindrical surfaces of the bolster case and bolster respectively allows the foot of the bolster sufficient play to obviate any tendency to gyrate. Thus it will be seen that with these surfaces arranged as described, and with the band pull at or near the middle of the same, the spindle is kept in a vertical position at all times, as the power of the band is exerted to bring these cylindrical surfaces in alignment, even when the unbalanced load tends to throw the bottom of the bolster out of its central relation. Thus the spindle remains true with the ring; the band pull does not deflect the spindles, whether tight or loose; and no influence is felt on the spinning of yarn by it. The position of the whirl is such that an even pressure is exerted upon the whole length of the spindle bearing. The spindle is elegant in design and finish and is of the best workmanship throughout. The Gravity Spindle is made in six different sizes, a table of which is appended.

The Doffer Guard, or latch, as it may be called, consists of a combined spindle-stop and oil-cover firmly pivoted to the oil-tube in such a manner that the spindle when dropped into the bolster is locked automatically without the use of a wrench or other device. It will be seen, however, that the spindle can be removed only by tilting the latch until the spindle is released from the stop, a thing which cannot occur in the ordinary process of doffing.

The following facts we believe will appeal most strongly to spinners:

1st. The spindle may be oiled without waste from the front of the frame while running, and the condition of the oil in the reservoirs be ascertained at any time by the overseer quickly, conveniently, and without previous preparation.

Whitin Gravity Spindles, Continued.



Spooler Spindle. Twister Spindle.

Whitin Gravity Spindles, Concluded.

2nd. The oil reservoir is always effectively covered, preventing entrance of lint and dust, and avoiding the possibility of oil-stained yarn.

3rd. No wrench is required to remove spindles for inspection. Reference to the accompanying cut will render the foregoing description easily understood.

WEIGHTS OF THE WHITIN GRAVITY SPINDLES.

Kind of Spindle.		Dia. of Whirl.	Weight.
Standard	Gravity Spinning Spindle..........	$\frac{3}{4}$ in.	$4\frac{1}{2}$ oz.
Medium	Gravity Spinning Spindle...... ...	$\frac{13}{16}$ or $\frac{7}{8}$ in.	6 oz.
Large	Gravity Spinning Spindle..........	$\frac{7}{8}$ in.	8 oz.
Water	Gravity Twisting Spindle..........	$\frac{7}{8}$ in.	$9\frac{1}{2}$ oz.
Heavy	Gravity Twisting Spindle..........	$1\frac{5}{16}$ in.	13 oz.
Ex. Heavy	Gravity Twisting Spindle..........	$1\frac{5}{16}$ in.	15 oz.

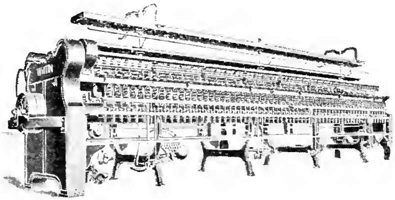
Whitin Gravity Twisting Spindle.

The foregoing illustration shows that the construction of our Twisting Spindles is almost identical with that of those used for spinning, the only difference being the addition of driving dogs above the whirl which fit into mortises cut in the bottom of the bobbin. This arrangement prevents the bobbin from slipping, with the attendant evil of slack twisted yarn. Our spindle has the great advantage in running, in that it remains perfectly true with the ring, at a low as well as a high speed. Bobbins may be used built for either long straight wind, long wind with top of bobbin reduced, long wind with taper at top, or cone filling wind. In our twisting frame the spindle rail is dropped so low that the bobbin having both heads the same size may be used, and is the style we recommend. The spindle is made in three sizes, which we style the Wet Twister, Heavy, and Extra Heavy Gravity Twisting Spindle. These spindles are finished in the same thorough manner as those used for spinning, are easily cleaned, and present the least possible opportunity for the collection of lint.

RING SPINNING FRAMES,

Manufactured by

The Whitin Machine Works.



These frames have been particularly designed to embody strength and rigidity with neatness of outline and accuracy in workmanship. They possess several advantages that are appreciated by all who have used them.

We wish to mention especially the following details of construction :—

The framing generally is substantial with angle roll beams, and spindle rails on the double web-rail principle with bridge pieces between sampson supports. The head end is of the well known "boxed" style, very rigid and of pleasing design.

All twist and builder-motion gearings are located in the closed boxed end and operatives are entirely protected from accidents. The gearing is readily accessible for cleaning or changing by simply removing a panel. The cylinder and jack gears are made of coarse pitch which results in few breakages. The gears of both the twist and draft motions are machine cut thus insuring smooth and easy running. A change in either the draft or twist is effected by a single adjustment in each case and a wide range is afforded by the different combinations.

The Fluted Rolls are made of the best roller steel and are irregularly fluted to avoid cutting the top rolls. The fluted boss on either side of the roll stands is drawn half an inch away from the bearing to avoid carrying oil to the top rolls. Either long or short boss rolls may be had as desired.

Whitin Spinning, Continued.

The Top Rolls are usually furnished covered, either shell or solid, and weighted with any saddle preferred.

The Roll stands are of such width as to insure long life to the neck of rolls. The cap bars are arranged to work independently, the finger at each roll bearing being divided so that when the bar is thrown back, only its own particular set of rolls is affected. Ample space is left between the halves of cap bar finger over the roll bearings for oiling.

Our patented Roving Traverse Motion is used. It is adjustable as to length of traverse and has a variable motion to prevent liability of top rolls becoming creased at any point. The trumpet rod is of steel with adjustable brass trumpets.

The Rings are adjustable with two or three screws according to style of ring holder used.

The Spindles with which our frames are equipped may be any of the following styles: Whitin Gravity, Draper, Rabbeth, Sherman or McMullan.

The Separator furnished is the No. 4 Whitin Automatic Separator, a detailed description of which will be found on page 134.

The Builder Motion has been entirely remodelled, the parts being strengthened and leverages increased resulting in a smooth and even motion of the ring rail. It is arranged for either warp or filling or both as desired. The change from warp to filling or vice versa is easily accomplished in a few minutes time. The traverses are from 4½″ to 8″. A patented device is applied for locking the ring rail when doffing. It is located so as to be conveniently operated by the foot of the spinner, and consists of an arm pivoted to the head cross shaft lifting arm in such a way that when the lifting arm is depressed the locking arm locks the ring rail at its lowest point automatically; a further slight depression releases the arm which drops back, and disengages the ring rail.

The Pulleys, varying in size from 6″ diameter to 18″

Whitin Spinning, Continued.

diameter by 2″ to 3″ face, are placed on the head or geared end of the frame unless otherwise ordered. The loose pulley runs in a fixed bushing which permits of easy and economical renewals in case of wear through heating and sticking of the pulley.

The Cylinders are 7″ or 8″ as ordered. The cylinder boxes are made on the self-oiling principle, a little fresh oil once a week being all that is required. An improvement in the setting of the boxes is applied whereby the cylinders may be taken from the frame and put back without any re-adjustment. The support of the head end pulley arbor bearing serves also as a guard for the pulley and the belt.

The Creels are made either one or two stories for single or double roving and are adjustable in height for any length of roving bobbin.

A simple and effective Thread Board Lifter is provided.

The frames are built in two widths, 36″ and 39″, and of spaces and lengths over all as per the following table :—See page 136.

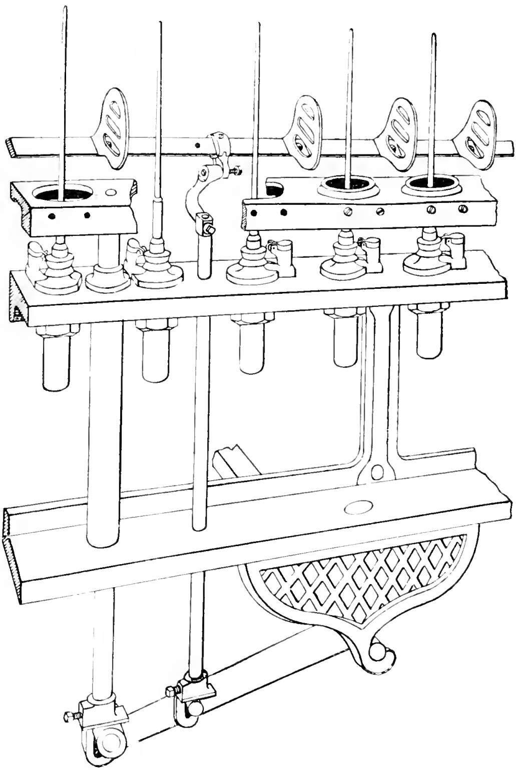
Whitin Spinning, Continued.

New Model

No. 4 Automatic Separator.

This form of Separator is designed for use on frames having a long traverse. The blades are made of stamped steel, combining strength with lightness. The rod on which the blades are fastened is also of steel, and is raised up and down in its path by auxiliary lifting rods resting upon a second set of rolls fastened to the arms of the regular cross shafts. The rod on which the blades are fastened is also joined to the lifting rods, so that the blades may be conveniently and quickly turned back out of the way when doffing. A simple device is also provided which automatically restores the blades to their working position after doffing, should the operator neglect to do so. As will be seen from the cut, the whole device is simple and readily adjusted.

Whitin Spinning, Continued.



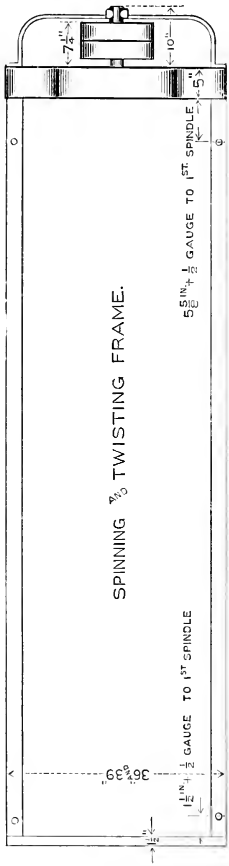
No. 4 Automatic Separator.

Whitin Spinning, Continued.

Lengths of Spinning Frames.

No. of Spindles.	2½ in. Space.		2⅝ in. Space.		2¾ in. Space.		3 in. Space.		3¼ in. Space.		3½ in. Space.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
112	13	8	14	3	14	10						
128	15	4	16		16	8						
144	17		17	9	18	6						
160	18	8	19	6	20	4						
176	20	4	21	3	22	2						
192	22		23		24							
208	23	8	24	9	25	10						
224	25	4	26	6	27	8						
240	27		28	3	29	6						
256	28	8	30		31	4						
272	30	4	31	9	33	2						
288	32		33	6	35							
304	33	8	35	3	36	10						
120							17		18	3	19	6
132							18	6	19	10½	21	3
144							20		21	6	23	
156							21	6	23	1½	24	9
168							23		24	9	26	6
180							24	6	26	4½	28	3
192							26		28		30	
204							27	6	29	7½	31	9
216							29		31	3	33	6
228							30	6	32	10½	35	3

Whitin Spinning, Continued.



Floor Plan.

Whitin Spinning, Continued.

Draught Table of Ring Spinning Frames.

Diameter of { Front Roll, 1 in. / Back Roll, ⅞ in.
Front Roll Gear, 28 T.
Back Roll Gear, 84 T.
Gear on Stud, 84 T.

Change on Stud.	Draught.
26 T	11.077
28	10.286
30	9.600
32	9.000
34	8.470
36	8.000
38	7.579
40	7.200
42	6.857
44	6.545
46	6.261
48	6.000
50	5.760
52	5.538
54	5.333
56	5.143
58	4.965

Diameter of { Front Roll, 1 in. / Back Roll, ⅞ in.
Front Roll Gear, 30 T.
Back Roll Gear, 84 T.
Gear on Stud, 84 T.

Change on Stud.	Draught.
26 T	10.338
28	9.600
30	8.960
32	8.400
34	7.906
36	7.467
38	7.074
40	6.720
42	6.400
44	6.109
46	5.843
48	5.600
50	5.376
52	5.169
54	4.978
56	4.800
58	4.634

Diameter of { Front Roll, 1 in. / Back Roll, ⅞ in.
Front Roll Gear, 30 T.
Back Roll Gear, 84 T.
Gear on Stud, 168 T.

Change on Stud.	Draught.
30 T	17.920
32	16.800
34	15.812
36	14.933
38	14.147
41	13.112
44	12.218
47	11.438
50	10.752
53	10.143
56	9.600
59	9.112
62	8.671
67	8.024
72	7.467
77	6.982
82	6.556

Diameter of { Front Roll, 1 in. / Back Roll, ⅞ in.
Front Roll Gear, 30 T.
Back Roll Gear, 84 T.
Gear on Stud, 60 T.

Change on Stud.	Draught
26 T	7.385
27	7.111
28	6.857
29	6.621
30	6.400
31	6.193
32	6.000
33	5.818
34	5.647
35	5.486
36	5.333
37	5.189
38	5.053
39	4.923
40	4.800
41	4.683
42	4.571

Whitin Spinning, Continued.

Draught Table of Ring Spinning Frames.

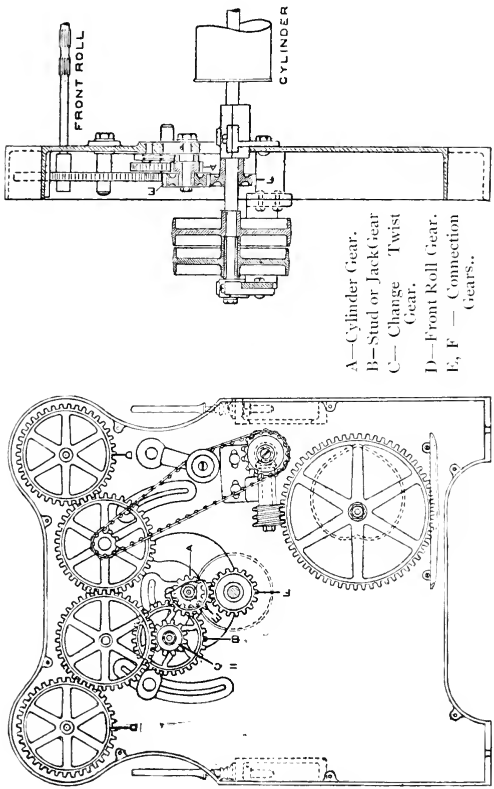
Diameter of { Front Roll, 1 inch. / Back Roll, $\frac{7}{8}$ inch

Front Roll Gear, 30 T. Back Roll Gear, 84 T.

Gear on Stud, 120 T.

Change on Stud.	Draught.	Change on Stud.	Draught.
26 T	14.770	39 T	9.846
27	14.222	40	9.600
28	13.715	41	9.366
29	13.241	42	9.143
30	12.800	43	8.930
31	12.387	45	8.533
32	12.000	48	8.000
33	11.636	50	7.680
34	11.294	52	7.385
35	10.971	54	7.111
36	10.666	56	6.857
37	10.378	58	5.621
38	10.105	60	6.400

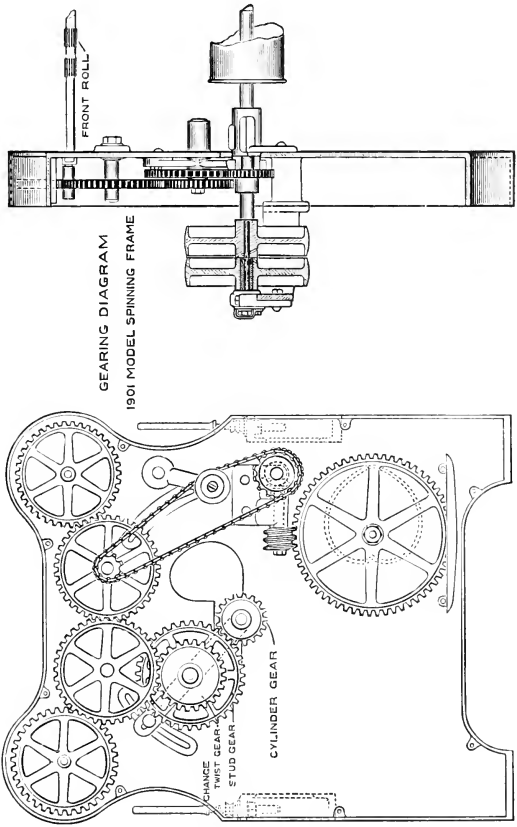
Whitin Spinning, Continued.



A—Cylinder Gear.
B—Stud or Jack Gear
C— Change Twist Gear.
D—Front Roll Gear.
E, F — Connection Gears.

Gearing Diagram of Ring Spinning Frames and Twister.
Built from 1893 to 1901.

Whitin Spinning, Continued.



GEARING DIAGRAM
1901 MODEL SPINNING FRAME

Whitin Spinning, Continued.

Ring Frame Change Twist Gear Table.

Cylinder $6\frac{1}{4}$ in. Diameter.

Front Roll 1 in. Dia. Front Roll Gear 108 Teeth.

Change Gear.	Whirl $\frac{3}{4}$ in. Dia. Cyl. : Whirl : : 1 : 7.44			Whirl $\frac{13}{16}$ in. Dia. Cyl. : Whirl : : 1 : 7.			Whirl $\frac{7}{8}$ in. Dia. Cyl. : Whirl : : 1 : 6.47		
	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
16T	63.92	32.84	15.98	60.14	30.90	15.03	55.58	28.56	13.89
17	60.16	30.91	15.04	56.60	29.09	14.15	52.31	26.88	13.08
18	56.81	29.20	14.20	53.45	27.47	13.36	49.41	25.39	12.35
19	53.82	27.66	13.45	50.64	26.02	12.66	46.81	24.05	11.70
20	51.13	26.28	12.78	48.11	24.72	12.02	44.47	22.85	11.12
21	48.70	25.02	12.17	45.82	23.55	11.45	42.35	21.76	10.59
22	46.48	23.89	11.62	43.74	22.48	10.93	40.42	20.77	10.10
23	44.46	22.85	11.12	41.83	21.50	10.45	38.67	19.87	9.67
24	42.61	21.90	10.65	40.09	20.60	10.02	37.05	19.04	9.26
25	40.91	21.02	10.23	38.49	19.78	9.62	35.57	18.28	8.89
26	39.33	20.21	9.83	37.01	19.02	9.25	34.20	17.58	8.55
27	37.88	19.46	9.47	35.64	18.31	8.91	32.94	16.93	8.23
28	36.52	18.77	9.13	34.36	17.66	8.59	31.76	16.32	7.94
29	35.26	18.12	8.82	33.18	17.05	8.29	30.67	15.76	7.67
30	34.09	17.52	8.52	32.07	16.48	8.02	29.64	15.23	7.41
31	32.99	16.95	8.25	31.04	15.95	7.76	28.69	14.74	7.17
32	31.96	16.42	7.99	30.07	15.45	7.52	27.79	14.28	6.95
33	30.99	15.92	7.75	29.16	14.97	7.29	26.95	13.85	6.74
34	30.08	15.45	7.52	28.30	14.54	7.07	26.16	13.44	6.54
35	29.22	15.01	7.30	27.49	14.13	6.87	25.41	13.06	6.35
36	28.41	14.60	7.10	26.73	13.74	6.68	24.70	12.69	6.16
37	27.64	14.20	6.91	26.00	13.36	6.50	24.03	12.35	6.01
38	26.91	13.82	6.73	25.32	13.01	6.33	23.40	12.03	5.85
39	26.22	13.47	6.56	24.67	12.68	6.17	22.80	11.72	5.70
40	25.57	13.14	6.39	24.05	12.36	6.01	22.23	11.42	5.56
41	24.94	12.82	6.24	23.47	12.06	5.87	21.69	11.15	5.42
42	24.35	12.51	6.09	22.91	11.78	5.73	21.17	10.88	5.29
43	23.78	12.22	5.94	22.38	11.50	5.59	20.68	10.63	5.17
44	23.24	11.94	5.81	21.87	11.24	5.47	20.21	10.39	5.05
45	22.72	11.68	5.68	21.38	10.99	5.34	19.76	10.16	4.94
46	22.23	11.42	5.56	20.92	10.75	5.23	19.33	9.93	4.84
47	21.76	11.18	5.44	20.47	10.52	5.12	18.92	9.72	4.73
48	21.30	10.95	5.32	20.05	10.30	5.01	18.52	9.52	4.63
50	20.45	10.51	5.11	19.24	9.89	4.81	17.79	9.14	4.45
52	19.67	10.11	4.92	18.50	9.51	4.63	17.10	8.79	4.28
54	18.94	9.73	4.73	17.82	9.16	4.45	16.47	8.46	4.12
56	18.26	9.38	4.56	17.18	8.83	4.30	15.88	8.16	3.97
58	17.63	9.06	4.41	16.59	8.52	4.15	15.33	7.88	3.83
60	17.04	8.76	4.26	16.04	8.24	4.01	14.82	7.62	3.70

Whitin Spinning, Continued.

Ring Frame Change Twist Gear Table.

Cylinder 7 in. Diameter.

Front Roll 1 in. Dia. Front Roll Gear 108 Teeth.

Change Gear.	Whirl $\frac{3}{4}$ in. Dia. Cyl. : Whirl : : 1 : 8.33			Whirl $\frac{13}{16}$ in. Dia. Cyl. : Whirl : : 1 : 7.68			Whirl $\frac{7}{8}$ in. Dia Cyl. : Whirl : : 1 : 7.25		
	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
16T	71.56	36.77	17.89	65.98	33.91	16.50	62.28	32.00	15.57
17	67.35	34.61	16.84	62.09	31.91	15.52	58.62	30.12	14.65
18	63.61	32.69	15.90	58.65	30.14	14.66	55.36	28.45	13.84
19	60.26	30.97	15.07	55.56	28.55	13.89	52.45	26.95	13.11
20	57.25	29.42	14.31	52.78	27.12	13.20	49.83	25.60	12.46
21	54.52	28.02	13.63	50.27	25.83	12.57	47.45	24.39	11.86
22	52.04	26.74	13.01	47.98	24.66	12.00	45.30	23.28	11.32
23	49.78	25.58	12.45	45.89	23.59	11.50	43.33	22.26	10.83
24	47.71	24.52	11.93	43.98	22.60	11.00	41.52	21.33	10.38
25	45.80	23.54	11.45	42.23	21.70	10.56	39.86	20.48	9.97
26	44.04	22.63	11.01	40.60	20.86	10.15	38.32	19.70	9.58
27	42.41	21.79	10.60	39.10	20.09	9.77	36.91	18.97	9.23
28	40.89	21.01	10.22	37.70	19.37	9.43	35.59	18.29	8.89
29	39.48	20.29	9.87	36.40	18.71	9.10	34.36	17.66	8.59
30	38.17	19.61	9.54	35.19	18.08	8.80	33.22	17.07	8.30
31	36.93	18.98	9.23	34.05	17.50	8.52	32.15	16.52	8.04
32	35.78	18.39	8.95	32.99	16.95	8.25	31.14	16.00	7.78
33	34.70	17.83	8.67	31.99	16.44	8.00	30.20	15.52	7.55
34	33.68	17.30	8.42	31.04	15.95	7.76	29.31	15.06	7.33
35	32.71	16.81	8.18	30.16	15.21	7.54	28.47	14.63	7.12
36	31.80	16.34	7.95	29.32	15.06	7.33	27.68	14.22	6.92
37	30.94	15.90	7.74	28.53	14.66	7.13	26.93	13.84	6.73
38	30.13	15.48	7.54	27.78	14.28	6.95	26.22	13.48	6.55
39	29.36	15.08	7.34	27.06	13.91	6.77	25.55	13.13	6.38
40	28.62	14.71	7.16	26.39	13.56	6.60	24.91	12.80	6.23
41	27.93	14.35	6.98	25.74	13.23	6.44	24.30	12.49	6.08
42	27.26	14.00	6.82	25.13	12.91	6.28	23.73	12.19	5.93
43	26.63	13.68	6.66	24.55	12.61	6.14	23.17	11.91	5.80
44	26.02	13.37	6.51	23.99	12.33	6.00	22.65	11.64	5.66
45	25.44	13.07	6.36	23.46	12.05	5.87	22.14	11.38	5.53
46	24.89	12.79	6.22	22.95	11.79	5.74	21.66	11.13	5.42
47	24.36	12.52	6.09	22.46	11.54	5.62	21.20	10.89	5.30
48	23.85	12.26	5.97	21.99	11.30	5.50	20.76	10.67	5.19
50	22.90	11.77	5.72	21.11	10.85	5.28	19.93	10.24	4.98
52	22.02	11.31	5.50	20.30	10.43	5.08	19.16	9.85	4.79
54	21.20	10.90	5.30	19.55	10.04	4.89	18.45	9.48	4.62
56	20.45	10.51	5.11	18.85	9.68	4.72	17.79	9.14	4.45
58	19.74	10.14	4.93	18.20	9.35	4.55	17.18	8.83	4.29
60	19.08	9.81	4.77	17.59	9.04	4.40	16.61	8.53	4.15

Whitin Spinning, Continued.

Ring Frame Change Twist Gear Table.

Cylinder 8 in. Diameter.

Front Roll 1 in. Dia. Front Roll Gear 108 Teeth.

Change Gear.	Whirl $\frac{3}{4}$ in. Dia. Cyl. : Whirl : : 1 : 9.52			Whirl $\frac{13}{16}$ in. Dia. Cyl. : Whirl : : 1 : 8.91			Whirl $\frac{7}{8}$ in. Dia Cyl. : Whirl : : 1 : 8.28		
	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.	Cyl. 22 T. Stud 88 T.	Cyl. 36 T. Stud 74 T.	Cyl. 55 T. Stud 55 T.
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
16T	81.78	42.03	20.45	76.55	39.93	19.13	71.13	36.55	17.78
17	76.97	39.56	19.24	72.04	37.02	18.01	66.95	34.40	16.74
18	72.70	37.36	18.17	68.04	34.96	17.01	63.23	32.49	15.81
19	68.87	35.39	17.22	64.46	33.12	16.11	59.90	30.78	14.97
20	65.43	33.62	16.36	61.24	31.46	15.31	56.91	29.24	14.22
21	62.31	32.02	15.58	58.31	29.97	14.58	54 20	27.85	13.55
22	59.48	30.56	14.87	55.67	28.61	13.92	51 73	26.58	12.93
23	56.89	29.23	14.22	53.25	27.36	13.31	49.48	25.42	12.37
24	54.52	28.02	13.63	51.03	26.22	12.76	47.42	24.37	11.86
25	52.34	26.90	13.08	48.99	25.17	12.25	45.52	23.39	11.38
26	50.33	25.86	12.58	47.10	24.21	11.77	43.77	22.49	10.94
27	48.46	24.90	12.12	45.36	23.31	11.34	42.15	21.66	10.54
28	46.73	24.01	11.68	43.74	22.48	10.93	40.65	20.89	10.16
29	45.12	23.19	11.28	42.23	21.70	10.55	39.24	20.17	9.81
30	43.62	22.41	10.90	40.82	20.98	10,21	37.94	19.49	9.48
31	42.21	21.69	10.55	39.51	20.30	9.88	36.71	18.87	9.18
32	40.89	21.01	10.22	38.28	19.67	9.57	35.57	18.28	8.89
33	39.65	20.38	9.91	37.12	19.07	9.28	34.49	17.72	8.62
34	38.49	19.78	9.62	36.02	18.51	9.01	33.47	17.20	8.37
35	37.39	19.21	9.35	35.14	17.98	8.75	32.52	16.71	8.13
36	36.35	18.68	9.09	34.02	17.48	8.51	31.61	16.24	7.90
37	35.37	18.17	8.84	33.10	17.01	8.27	30.76	15.81	7.69
38	34.44	17.69	8.60	32.23	16.55	8.05	29.95	15.39	7.49
39	33.55	17.24	8.38	31.40	16.13	7.85	29.18	15.00	7.29
40	32.71	16.81	8.18	30.62	15.73	7.65	28.45	14.62	7.11
41	31.91	16.40	7.98	29.88	15.35	7.47	27.76	14.26	6.94
42	31.16	16.01	7.79	29.16	14.98	7.29	27.10	13 92	6.77
43	30.43	15.64	7.61	28.48	14.64	7.12	26.47	13.60	6.62
44	29.74	15.28	7.43	27.84	14.30	6.96	25.87	13.29	6.47
45	29.08	14.94	7.27	27.21	13.98	6.80	25.29	13.00	6.32
46	28.45	14.62	7.11	26.62	13.68	6.65	24.74	12.71	6.18
47	27.84	14.31	6.96	26.06	13.39	6.51	24.21	12.44	6.05
48	27.26	14.01	6.81	25.52	13.11	6.38	23.71	12.18	5.93
50	26.17	13.45	6.54	24.49	12.59	6.12	22.76	11.70	5.69
52	25.16	12.93	6.29	23.56	12.10	5.89	21.89	11.25	5.47
54	24.23	12.45	6.06	22.68	11.66	5.67	21.08	10.83	5.27
56	23.37	12.01	5.84	21.87	11.24	5.46	20.32	10.44	5.08
58	22.56	11.59	5.64	21.12	10.85	5.28	19.62	10.08	4.91
60	21.81	11.21	5.45	20.41	10.49	5.10	18.97	9.75	4.74

Whitin Spinning, Continued.

Twist Tables.

Counts or Numbers.	Square Root.	Frame Warp Twist.	Extra Mule Warp Twist.	Frame Filling Twist.	Mule Filling Twist.	Twist for Doubling.	Hosiery Yarn
1	1.0000	4.75	4.00	3.50	3.25	2.75	2.50
2	1.4142	6.72	5.66	4.95	4.60	3.89	3.53
3	1.7320	8.23	6.93	6.06	5.63	4.76	4.33
4	2.0000	9.50	8.00	7.00	6.50	5.50	5.00
5	2.2360	10.62	8.94	7.83	7.27	6.15	5.59
6	2.4494	11.63	9.80	8.57	7.96	6.73	6.12
7	2.6457	12.56	10.58	9.26	8.60	7.27	6.61
8	2.8284	13.43	11.31	9.90	9.19	7.78	7.07
9	3.0000	14.25	12.00	10.50	9.75	8.25	7.50
10	3.1622	15.02	12.65	11.07	10.27	8.69	7.90
11	3.3166	15.75	13.26	11.61	10.78	9.12	8.29
12	3.4641	16.45	13.86	12.12	11.26	9.52	8.66
13	3.6055	17.12	14.42	12.62	11.72	9.91	9.01
14	3.7416	17.77	14.96	13.10	12.16	10.29	9.35
15	3.8729	18.39	15.49	13.56	12.59	10.65	9.68
16	4.0000	19.00	16.00	14.00	13.00	11.00	10.00
17	4.1231	19.58	16.49	14.43	13.40	11.34	10.31
18	4.2426	20.15	16.97	14.85	13.79	11.66	10.60
19	4.3588	20.70	17.43	15.26	14.17	11.98	10.89
20	4.4721	21.24	17.89	15.65	14.53	12.30	11.18
21	4.5825	21.76	18.33	16.04	14.89	12.60	11.46
22	4.6904	22.27	18.76	16.42	15.24	12.89	11.73
23	4.7958	22.78	19.80	16.79	15.59	13.19	11.99
24	4.8989	23.27	19.59	17 15	15.92	13.47	12.25
25	5.0000	23.75	20.00	17.50	16.25	13.75	12.50
26	5.0990	24.22	20.39	17.85	16.57	14.02	12.75
27	5.1961	24.68	20.78	18.19	16.89	14.29	12.99
28	5.2915	25.13	21.16	18.52	17.20	14.55	13.23
29	5.3851	25.58	21.54	18.85	17.50	14.81	13.46
30	5.4772	26.02	21.91	19.17	17.80	15.06	13.69
31	5.5677	26.44	22.27	19.49	18.10	15.31	13.92
32	5.6568	26.87	22.63	19.80	18.38	15.55	14.14
33	5.7445	27.28	22.98	20.11	18.67	15.80	14.36
34	5.8309	27.69	23.32	20.41	18.95	16.03	14.58
35	5.9160	28.10	23.66	20.71	19.23	16.27	14.79
36	6.0000	28.50	24.00	21.00	19.50	16.50	15.00
37	6.0827	28.89	24.33	21.29	19.77	16.72	15.21
38	6.1644	29.28	24.66	21.58	20.03	16.95	15.41
39	6.2449	29.66	24.98	21.86	20.30	17.17	15.61
40	6.3245	30.04	25.30	22.14	20.55	17.39	15.81
41	6.4031	30.42	25.61	22.41	20.81	17.61	16.01
42	6.4807	30.78	25.92	22.68	21.06	17.82	16.20
43	6.5574	31.14	26.23	22.95	21.31	18.03	16.39
44	6.6332	31.50	26.53	23.22	21.56	18.24	16.58
45	6.7082	31.86	26.83	23.48	21.80	18.45	16.77
46	6.7823	32.21	27.13	23.74	22.04	18.65	16.96
47	6.8556	32.56	27.42	23.99	22.28	18.85	17.14
48	6.9282	32.90	27.71	24.25	22.52	19.05	17.32
49	7.0000	33.25	28.00	24.50	22.75	19.25	17.50
50	7.0710	33.58	28.28	24.75	22.98	19.44	17.68

Whitin Spinning, Continued.

Twist Tables. Continued.

Counts or Numbers.	Square Root.	Frame Warp Twist.	Extra Mule Warp Twist.	Frame Filling Twist.	Mule Filling Twist.	Twist for Doubling.	Hosiery Yarn.
51	7.1414	33.92	28.56	24.99	23.21	19.64	17.85
52	7.2111	34.25	28.84	25.24	23.44	19.83	18.03
53	7.2801	34.58	29.12	25.48	23.66	20.02	18.20
54	7.3484	34.90	29.39	25.72	23.88	20.21	18.37
55	7.4161	35.22	29.66	25.96	24.10	20.39	18.54
56	7.4833	35.54	29.93	26.19	24.32	20.58	18.71
57	7.5498	35.86	30.20	26.42	24.53	20.76	18.87
58	7.6157	36.17	30.46	26.66	24.75	20.94	19.04
59	7.6811	36.48	30.72	26.88	24.96	21.12	19.20
60	7.7459	36.79	30.98	27.11	25.16	21.30	19.36
61	7.8102	37.10	31.24	27.34	25.38	21.48	
62	7.8740	37.40	31.49	27.56	25.59	21.65	
63	7.9372	37.70	31.74	27.78	25.79	21.83	
64	8.0000	38.00	32.00	28.00	26.00	22.00	
65	8.0622	38.29	32.25	28.22	26.20	22.17	
66	8.1240	38.59	32.49	28.43	26.40	22.34	
67	8.1853	38.88	32.74	28.65	26.60	22.51	
68	8.2462	39.16	32.98	28.86	26.80	22.68	
69	8.3066	39.46	33.22	29.07	26.99	22.84	
70	8.3666	39.74	33.46	29.28	27.19	23.01	
71	8.4261	40.02	33.70	29.49	27.38	23.17	
72	8.4852	40.30	33.94	29.70	27.58	23.33	
73	8.5440	40.58	34.17	29.90	27.77	23.50	
74	8.6023	40.86	34.41	30.11	27.96	23.65	
75	8.6602	41.14	34.64	30.31	28.14	23.81	
76	8.7177	41.41	34.87	30.51	28.33	23.97	
77	8.7749	41.68	35.09	30.71	28.51	24.13	
78	8.8317	41.95	35.32	30.91	28.70	24.28	
79	8.8881	42.22	35.55	31.11	28.89	24.44	
80	8.9442	42.48	35.77	31.30	29.07	24.60	
81	9.0000	42.75	36.00	31.50	29.25	24.75	
82	9.0553	43.01	36.22	31.69	29.43	24.90	
83	9.1104	43.27	36.44	31.89	29.61	25.05	
84	9.1651	43.53	36.66	32.08	29.79	25.20	
85	9.2195	43.79	36.88	32.27	29.96	25.35	
86	9.2736	44.05	37.09	32.46	30.14	25.50	
87	9.3273	44.30	37.31	32.65	30.31	25.65	
88	9.3808	44.56	37.52	32.83	30.48	25.79	
89	9.4339	44.81	37.73	33.02	30.66	25.94	
90	9.4868	45.06	37.95	33.20	30.83	26.09	
91	9.5393	45.31	38.16	33.39	31.00	26.23	
92	9.5916	45.56	38.36	33.57	31.17	26.37	
93	9.6436	45.80	38.57	33.75	31.34	26.52	
94	9.6953	46.05	38.78	33.93	31.51	26.66	
95	9.7467	46.30	38.98	34.11	31.67	26.80	
96	9.7979	46.54	39.19	34.29	31.84	26.94	
97	9.8488	46.78	39.39	34.47	32.01	27.08	
98	9.8994	47.02	39.60	34.65	32.17	27.22	
99	9.9498	47.26	39.80	34.82	32.33	27.36	
100	10.0000	47.50	40.00	35.00	32.50	27.50	

Whitin Spinning, Continued.

Twist Tables. Continued.

Counts or Numbers.	Square Root.	Frame Warp Twist.	Extra Mule Warp Twist.	Frame Filling Twist.	Mule Filling Twist.	Twist for Doubling.	Hosiery Yarn.
101	10.0499	47.74	40.20	35.17	32.66	27.64	
102	10.0995	47.97	40.40	35.35	32.82	27.77	
103	10.1489	48.21	40.60	35.52	32.98	27.91	
104	10.1980	48.44	40.79	35.69	33.14	28.04	
105	10.2470	48.67	40.99	35.86	33.30	28.18	
106	10.2956	48.90	41.18	36.03	33.46	28.31	
107	10.3441	49.13	41.38	36.20	33.62	28.44	
108	10.3923	49.36	41.57	36.37	33.78	28.58	
109	10.4403	49.59	41.76	36.54	33.93	28.71	
110	10.4881	49.82	41.95	36.71	34.09	28.84	
111	10.5357	50.04	42.14	36.87	34.24	28.97	
112	10.5830	50.27	42.33	37.04	34.39	29.10	
113	10.6301	50.49	42.52	37.21	34.55	29.23	
114	10.6771	50.72	42.71	37.37	34.70	29.36	
115	10.7238	50.94	42.90	37.53	34.85	29.49	
116	10.7703	51.16	43.08	37.70	35.00	29.62	
117	10.8167	51.38	43.27	37.86	35.15	29.75	
118	10.8628	51.60	43.45	38.02	35.30	29.87	
119	10.9087	51.82	43.63	38.18	35.45	30.00	
120	10.9545	52.03	43.82	38.34	35.60	30.12	
121	11.0000	52.25	44.00	38.50	35.75	30.25	
122	11.0454	52.47	44.18	38.66	35.90	30.27	
123	11.0905	52.68	44.36	38.82	36.04	30.50	
124	11.1355	52.89	44.54	38.97	36.19	30.62	
125	11.1803	53.11	44.72	39.13	36.34	30.75	
126	11.2250	53.32	44.90	39.29	36.48	30.87	
127	11.2694	53.53	45.08	39.44	36.63	30.99	
128	11.3137	53.74	45.25	39.60	36.77	31.11	
129	11.3578	53.95	45.43	39.75	36.91	31.23	
130	11.4018	54.16	45.61	39.91	37.06	31.35	
131	11.4455	54.37	45.78	40.06	37.20	31.48	
132	11.4891	54.57	45.96	40.21	37.34	31.60	
133	11.5326	54.78	46.13	40.36	37.48	31.71	
134	11.5758	54.99	46.30	40.52	37.62	31.83	
135	11.6190	55.19	46.48	40.67	37.76	31.95	
136	11.6619	55.39	46.65	40.82	37.90	32.07	
137	11.7047	55.60	46.82	40.97	38.04	32.19	
138	11.7473	55.80	46.99	41.12	38.18	32.31	
139	11.7898	56.00	47.16	41.26	38.32	32.42	
140	11.8322	56.20	47.33	41.41	38.45	32.54	
141	11.8743	56.40	47.50	41.56	38.59	32.65	
142	11.9164	56.60	47.67	41.71	38.73	32.77	
143	11.9583	56.80	47.83	41.85	38.86	32.89	
144	12.0000	57.00	48.00	42.00	39.00	33.00	
145	12.0416	57.20	48.17	42.15	39.14	33.11	
146	12.0830	57.39	48.33	42.29	39.27	33.23	
147	12.1244	57.59	48.50	42.44	39.40	33.34	
148	12.1655	57.79	48.66	42.58	39.54	33.46	
149	12.2066	57.98	48.83	42.72	39.67	33.57	
150	12.2474	58.18	48.99	42.87	39.80	33.68	

Whitin Spinning, Continued.

Twist Tables. Concluded.

Counts or Numbers.	Square Root.	Frame Warp Twist.	Extra Mule Warp Twist.	Frame Filling Twist.	Mule Filling Twist.	Twist for Doubling.	Hosiery Yarn.
151	12.2882	58.37	49.15	43.01	39.94	33.79	
152	12.3288	58.56	49.32	43.15	40.07	33.90	
153	12.3693	58.75	49.48	43.29	40.20	34.02	
154	12.4097	58.95	49.64	43.43	40.33	34.13	
155	12.4499	59.14	49.80	43.57	40.46	34.24	
156	12.4900	59.33	49.96	43.72	40.59	34.35	
157	12.5300	59.52	50.12	43.86	40.72	34.46	
158	12.5698	59.71	50.28	43.99	40.85	34.57	
159	12.6095	59.90	50.44	44.13	40.98	34.68	
160	12.6491	60.08	50.60	44.27	41.11	34.79	
161	12.6886	60.27	50.75	44.41	41.24	34.89	
162	12.7279	60.46	50.91	44.55	41.37	35.00	
163	12.7671	60.64	51.07	44.68	41.49	35.11	
164	12.8062	60.83	51.22	44.82	41.62	35.22	
165	12.8452	61.01	51.38	44.96	41.75	35.32	
166	12.8841	61.20	51.54	45.09	41.87	35.43	
167	12.9228	61.38	51.69	45.23	42.00	35.54	
168	12.9615	61.57	51.85	45.37	42.12	35.64	
169	13.0000	61.75	52.00	45.50	42.25	35.75	
170	13.0384	61.93	52.15	45.63	42.37	35.86	
171	13.0767	62.11	52.31	45.77	42.50	35.96	
172	13.1149	62.30	52.46	45.90	42.62	36.07	
173	13.1529	62.48	52.61	46.04	42.75	36.17	
174	13.1909	62.66	52.76	46.17	42.87	36.27	
175	13.2288	62.84	52.92	46.30	42.99	36.38	
176	13.2665	63.02	53.07	46.43	43.12	36.48	
177	13.3041	63.19	53.22	46.56	43.24	36.59	
178	13.3417	63.37	53.37	46.70	43.36	36.69	
179	13.3791	63.55	53.52	46.83	43.48	36.79	
180	13.4164	63.73	53.67	46.96	43.60	36.90	
181	13.4536	63.90	53.81	47.09	43.72	37.00	
182	13.4907	64.08	53.96	47.22	43.84	37.10	
183	13.5277	64.26	54.11	47.35	43.97	37.20	
184	13.5647	64.43	54.26	47.48	44.09	37.30	
185	13.6015	64.61	54.41	47.61	44.20	37.40	
186	13.6382	64.78	54.55	47.73	44.32	37.51	
187	13.6748	64.96	54.70	47.86	44.44	37.61	
188	13.7113	65.13	54.85	47.99	44.56	37.71	
189	13.7477	65.30	54.99	48.12	44.68	37.81	
190	13.7840	65.47	55.14	48.24	44.80	37.91	
191	13.8203	65.65	55.28	48.37	44.92	38.01	
192	13.8564	65.82	55.43	48.50	45.03	38.11	
193	13.8924	65.99	55.57	48.62	45.15	38.20	
194	13.9284	66.16	55.71	48.75	45.27	38.30	
195	13.9642	66.33	55.86	48.87	45.38	38.40	
196	14.0000	66.50	56.00	49.00	45.50	38.50	
197	14.0357	66.67	56.14	49.12	45.62	38.60	
198	14.0712	66.84	56.28	49.25	45.73	38.70	
199	14.1067	67.01	56.43	49.37	45.85	38.79	
200	14.1421	67.17	56.57	49.50	45.96	38.89	

Whitin Spinning, Continued.

Table for Numbering Yarn by Grains.

No. of Yarn.	Grains per Hank.	No. of Yarn.	Grains per Hank.	No. of Yarn.	Grains per Hank.
9	777.77	20¼	344.44	31½	222.22
9¼	756.75	20½	341.46	31¾	220.47
9½	736.84	20¾	337.34	32	218.75
9¾	720.51	21	333.33	32¼	217.05
10	700.00	21¼	329.41	32½	215.38
10¼	682.92	21½	325.58	32¾	213.74
10½	666.66	21¾	321.83	33	212.12
10¾	651.16	22	318.18	33¼	210.52
11	636.36	22¼	314.60	33½	208.95
11¼	622.22	22½	311.11	33¾	207.40
11½	608.69	22¾	307.69	34	205.88
11¾	595.74	23	304.34	34¼	204.30
12	583.33	23¼	301.07	34½	202.89
12¼	571.42	23½	297.87	34¾	201.43
12½	560.00	23¾	294.73	35	200.00
12¾	549.01	24	291.66	35¼	198.58
13	546.15	24¼	288.65	35½	197.32
13¼	526.11	24½	285.71	35¾	195.80
13½	518.51	24¾	282.82	36	194.44
13¾	509.09	25	280.00	36¼	193.10
14	500.00	25¼	277.22	36½	191.78
14¼	491.22	25½	274.50	36¾	190.47
14½	482.75	25¾	271.84	37	189.18
14¾	474.57	26	269.23	37¼	187.91
15	466.66	26¼	266.66	37½	186.66
15¼	459.01	26½	264.15	37¾	185.42
15½	451.61	26¾	261.68	38	184.21
15¾	444.44	27	259.25	38¼	183.00
16	437.50	27¼	256.88	38½	181.81
16¼	430.76	27½	254.54	38¾	180.63
16½	424.24	27¾	252.52	39	179.48
16¾	417.91	28	250.00	39¼	178.34
17	411.76	28¼	247.78	39½	177.21
17¼	405.79	28½	245.61	39¾	176.10
17½	400.00	28¾	243.46	40	175.00
17¾	394.36	29	241.37	40¼	173.91
18	388.88	29¼	239.31	40½	172.83
18¼	383.56	29½	237.28	40¾	171.77
18½	378.37	29¾	235.29	41	170.73
18¾	373.33	30	233.33	41¼	169.69
19	368.42	30¼	231.40	41½	168.67
19¼	363.63	30½	229.50	41¾	167.66
19½	358.97	30¾	227.64	42	166.66
19¾	354.43	31	225.80	42¼	165.68
20	350.00	31¼	224.08	42½	164.70

Whitin Spinning, Continued.

Table for Numbering Yarn by Grains.

No. of Yarn.	Grains per Hank.	No. of Yarn.	Grains per Hank.	No. of Yarn.	Grains per Hank.
42¾	163.74	54	129.62	81	86.40
43	162.79	54¼	129.03	82	85.40
43¼	161.84	54½	128.44	83	84.30
43½	160.91	54¾	127.85	84	83.30
43¾	160.00	55	127.27	85	82.40
44	159.09	55¼	126.69	86	81.40
44¼	158.19	55½	126.12	87	80.40
44½	157.41	55¾	125.56	88	79.50
44¾	156.42	56	125.00	89	78.60
45	155.55	56¼	124.49	90	77.80
45¼	154.69	56½	123.89	91	76.90
45½	153.84	56¾	123.34	92	76.10
45¾	152.95	57	122.80	93	75.30
46	152.17	57¼	122.27	94	74.50
46¼	151.30	57½	121.73	95	73.70
46½	150.53	57¾	121.21	96	72.[illegible]0
46¾	149.73	58	120.68	97	72.30
47	148.93	58¼	120.17	98	71.40
47¼	148.14	58½	119.65	99	70.70
47½	147.34	58¾	119.14	100	70.00
47¾	146.59	59	118.47	105	66.70
48	145.83	59¼	118.14	110	63.60
48¼	145.07	59½	117.64	115	60.90
48½	144.32	59¾	117.15	120	58.30
48¾	143.58	60	116.66	125	56.00
49	142.85	61	114.80	130	53.80
49¼	142.13	62	112.90	135	51.80
49½	141.41	63	111.10	140	50.00
49¾	140.70	64	109.30	145	48.30
50	140.00	65	107.70	150	46.70
50¼	139.30	66	106.10	155	45.20
50½	138.61	67	104.40	160	43.80
50¾	137.93	68	102.90	165	42.40
51	137.29	69	101.40	170	41.20
51¼	136.58	70	100.00	175	40.00
51½	135.92	71	98.60	180	38.90
51¾	135.26	72	97.20	185	37.80
52	134.61	73	95.90	190	36.80
52¼	133.97	74	94.60	195	35.90
52½	133.33	75	93.30	200	35.00
52¾	132.70	76	92.10		
53	132.07	77	90.90		
53¼	131.45	78	89.70		
53½	130.84	79	88.60		
53¾	130.23	80	87.50		

Whitin Spinning, Continued.

Sizes of Rings and Bobbins

Recommended for Spinning Frames on Different Yarns.

WARP.

Number of Yarn.	Space of Frame.	Diam. of Ring.	Length of Traverse.	Length of Bobbin.	Diam. of Bobbin.	Gravity Spindle.
1– 5	3 1/2″	2 1/2″	7 1/2″	8 3/4″	1″ x 1 1/4″	Large.
6– 11	3 1/4″	2 1/4″	7 1/2″	8 3/4″	1″ x 1 1/4″	Large.
12– 15	3 1/4″	2 1/8″	7 1/4″	8 1/2″	1″ x 1 1/4″	Large.
16– 19	3″	2″	7″	8 1/4″	1″ x 1 1/4″	Medium.
20– 24	3″	1 7/8″	7″	8 1/4″	1″ x 1 1/4″	Medium.
25– 29	2 3/4″	1 3/4″	6 1/2″	7 3/4″	15/16″ x 1 3/16″	Medium.
30– 39	2 3/4″	1 5/8″	6 1/4″	7 1/2″	7/8″ x 1 1/8″	Standard.
40– 49	2 3/4″	1 1/2″	6″	7 1/4″	7/8″ x 1 1/8″	Standard.
50– 59	2 3/4″	1 1/2″	6″	7 1/4″	13/16″ x 1 1/16″	Standard.
60–120	2 3/4″	1 3/8″	5 1/2″	6 3/4″	13/16″ x 1 1/16″	Standard.

FILLING.

Number of Yarn.	Space of Frame.	Diam. of Ring.	Length of Traverse.	Length of Bobbin.	Diam. of Bobbin.	Gravity Spindle.
1– 9	2 3/4″	1 5/8″	7 1/2″	8 3/4″	3/4″ x 1 1/2″	Medium.
10– 19	2 3/4″	1 1/2″	7″	8 1/4″	3/4″ x 1 3/8″	Medium.
20– 29	2 3/4″	1 7/16″	6 1/2″	7 3/4″	5/8″ x 1 5/16″	Medium.
30– 35	2 3/4″	1 3/8″	6 1/2″	7 3/4″	5/8″ x 1 1/4″	Medium.
36– 39	2 3/4″	1 5/16″	6″	7 1/4″	5/8″ x 1 3/16″	Standard.
40– 49	2 3/4″	1 1/4″	6″	7 1/4″	5/8″ x 1 1/8″	Standard.
50– 59	2 3/4″	1 1/4″	5 1/2″	6 3/4″	5/8″ x 1 1/8″	Standard
60– 79	2 3/4″	1 3/16″	5 1/2″	6 3/4″	5/8″ x 1 1/16″	Standard
80–120	2 3/4″	1 1/8″	5 1/2″	6 3/4″	5/8″ x 1″	Standard.

Note:—Warp and Filling Rings for Numbers above No. 50, use No. 1 Flange.

Whitin Spinning, Continued.

Production Table of Ring Warp Yarn.

Front Roll 1 in. Diameter.

Number of Yarn	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
4	9.50	166.0	4950	9.115	2.279	4
5	10.62	163.2	5450	8.962	1.792	5
6	11.63	161.4	5900	8.863	1.477	6
7	12.56	159.6	6300	8.764	1.252	7
8	13.43	157.6	6650	8.654	1.082	8
9	14.25	156.3	7000	8.583	.954	9
10	15.02	153.6	7250	8.530	.853	10
11	15.75	151.5	7500	8.413	.765	11
12	16.45	150.0	7750	8.330	.694	12
13	17.12	147.8	7950	8.208	.631	13
14	17.77	145.9	8150	8.103	.579	14
15	18.39	143.6	8300	7.975	.532	15
16	19.00	141.5	8450	7.858	.497	16
17	19.58	139.7	8600	7.758	.468	17
18	20.15	138.1	8750	7.670	.429	18
19	20.70	136.0	8850	7.553	.398	19
20	21.24	134.0	8950	7.525	.376	20
21	21.76	132.3	9050	7.430	.354	21
22	22.27	130.0	9100	7.301	.332	22
23	22.78	127.8	9150	7.177	.312	23
24	23.27	125.8	9200	7.065	.294	24
25	23.75	124.6	9300	6.998	.280	25
26	24.22	123.7	9400	7.024	.270	26
27	24.68	121.9	9450	6.922	.256	27
28	25.13	120.2	9500	6.825	.244	28
29	25.58	118.2	9500	6.712	.231	29
30	26.02	116.2	9500	6.598	.220	30
31	26.44	114.4	9500	6.496	.210	31
32	26.87	112.5	9500	6.388	.200	32
33	27.28	111.4	9550	6.326	.192	33
34	27.69	110.3	9600	6.263	.184	34
35	28.10	108.7	9600	6.240	.178	35

Allowance has been made for cleaning, oiling and doffing.

Whitin Spinning, Continued.

Production Table of Ring Warp Yarn.

Front Roll 1 in. Diameter.

Number of Yarn	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
36	28.50	108.3	9700	6.217	.173	36
37	28.89	106.8	9700	6.131	.166	37
38	29.28	106.5	9800	6.114	.161	38
39	29.66	105.2	9800	6.039	.155	39
40	29.07	106.2	9700	6.097	.152	40
41	29.44	104.9	9700	6.022	.147	41
42	29.80	103.6	9700	5.947	.142	42
43	30.13	102.5	9700	5.884	.137	43
44	30.49	101.2	9700	5.810	.132	44
45	30.82	100.2	9700	5.815	.129	45
46	31.18	99.0	9700	5.745	.125	46
47	31.51	98.0	9700	5.687	.121	47
48	31.83	97.0	9700	5.629	.117	48
49	32.20	95.9	9700	5.565	.114	49
50	32.52	94.9	9700	5.508	.110	50
55	33.34	91.6	9600	5.373	.098	55
60	34.83	87.7	9600	5.199	.087	60
65	36.27	84.2	9600	4.991	.077	65
70	37.62	81.2	9600	4.814	.069	70
75	38.10	79.4	9500	4.707	.063	75
80	39.33	76.9	9500	4.606	.058	80
85	39.64	74.0	9100	4.433	.052	85
90	40.76	71.0	9100	4.297	.048	90
95	41.88	68.5	9000	4.146	.044	95
100	42.00	65.9	8700	4.030	.040	100
110	44.01	61.5	8500	3.761	.034	110
120	44.89	58.1	8200	3.553	.030	120
130	46.74	53.1	7800	3.281	.025	130
140	47.32	47.1	7000	2.910	.021	140
150	48.96	42.9	6600	2.650	.018	150
160	50.56	37.8	6000	2.335	.015	160
170	52.12	33.6	5500	2.076	.012	170

Allowance has been made for cleaning, oiling and doffing.

Whitin Spinning, Continued.

Production Table of Ring Filling Yarn.

Front Roll 1 in. Diameter.

Number of Yarn	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
4	7.00	182.0	4000	9.656	2.414	4
5	7.83	178.8	4400	9.483	1.897	5
6	8.57	178.3	4800	9.568	1.594	6
7	9.26	176.9	5150	9.494	1.356	7
8	9.90	175.3	5450	9.407	1.176	8
9	10.50	172.7	5700	9.267	1.030	9
10	11.07	171.0	5950	9.283	.928	10
11	11.61	168.6	6150	9.153	.832	11
12	12.12	166.7	6350	9.154	.763	12
13	12.62	164.0	6500	9.005	.693	13
14	13.10	162.7	6700	8.934	.638	14
15	13.56	160.7	6850	8.825	.588	15
16	14.00	158.0	6950	8.676	.542	16
17	14.43	156.6	7100	8.599	.506	17
18	14.85	154.3	7200	8.473	.471	18
19	15.26	152.5	7300	8.374	.441	19
20	15.65	150.4	7400	8.352	.418	20
21	16.04	148.8	7500	8.264	.394	21
22	16.42	147.3	7600	8.181	.372	22
23	16.79	145.9	7700	8.103	.352	23
24	17.15	144.7	7800	8.034	.335	24
25	17.50	142.8	7850	7.930	.317	25
26	17.85	140.0	7850	7.862	.302	26
27	17.64	141.6	7850	7.952	.295	27
28	17.99	139.7	7900	7.845	.280	28
29	18.29	137.4	7900	7.717	.266	29
30	18.35	136.9	7900	7.774	.259	30
31	18.62	135.0	7900	7.666	.248	31
32	18.64	134.9	7900	7.460	.239	32
33	18.94	133.3	7900	7.509	.229	33
34	18.95	132.7	7900	7.535	.222	34
35	19.23	130.7	7900	7.503	.214	35

Allowance has been made for cleaning, oiling and doffing.

Whitin Spinning, Concluded.

Production Table of Ring Filling Yarn.

Front Roll 1 in. Diameter.

Number of Yarn	Twist per Inch.	Rev. of Front Roll per Minute.	Rev. of Spindles per Minute.	Hanks per Day per Spindle.	Pounds per day per Spindle.	Number of Yarn.
36	19.50	128.9	7900	7.400	.206	36
37	19.77	127.2	7900	7.302	.195	37
38	20.03	125.5	7900	7.205	.190	38
39	20.30	123.8	7900	7.107	.182	39
40	20.55	122.3	7900	7.098	.177	40
41	20.81	120.8	7900	7.010	.171	41
42	21.06	119.4	7900	6.929	.165	42
43	21.31	117.9	7900	6.842	.159	43
44	21.56	116.6	7900	6.767	.154	44
45	21.80	115.3	7900	6.691	.149	45
46	22.04	114.1	7900	6.622	.144	46
47	22.28	112.8	7900	6.546	.139	47
48	22.52	111.6	7900	6.477	.135	48
49	22.75	110.5	7900	6.412	.131	49
50	22.98	109.4	7900	6.417	.128	50
55	24.10	104.3	7900	6.183	.112	55
60	25.16	99.9	7900	5.985	.100	60
65	25.79	96.2	7800	5.760	.088	65
70	26.75	92.8	7800	5.559	.079	70
75	27.71	89.6	7800	5.367	.072	75
80	28.16	87.0	7700	5.266	.066	80
85	29.04	83.3	7600	5.042	.059	85
90	29.39	80.1	7400	4.899	.054	90
95	30.19	78.0	7400	4.770	.050	95
100	30.50	75.1	7200	4.639	.046	100
110	31.44	69.8	6900	4.312	.039	110
120	32.85	63.0	6500	3.892	.032	120
130	34.20	57.7	6200	3.564	.027	130
140	35.49	52.9	5900	3.248	.023	140
150	36.72	48.6	5600	3.002	.020	150
160	37.92	44.5	5300	2.750	.017	160
170	39.09	40.8	5000	2.520	.015	170

Allowance has been made for cleaning, oiling and doffing.

Production Table for Self-Acting Mule.

Number of Yarn.	64-inch Stretches per Minute.	Production per day of ten hours. Calculated	Actual (10 per ct. Stoppages.)	
		Hanks per Spindle.	Hanks per Spindle	Pounds per Spindle.
4	6.00	7.62	6.86	1.71
5	6.00	7.62	6.86	1.37
6	6.00	7.62	6.86	1.14
7	6.00	7.62	6.86	.980
8	6.00	7.62	6.86	.858
9	6.00	7.62	6.86	.762
10	6.00	7.62	6.86	.686
11	6.00	7.62	6.86	.624
12	6.00	7.62	6.86	.572
13	6.00	7.62	6.86	.528
14	5.50	6.99	6.29	.449
15	5.50	6.99	6.29	.419
16	5.50	6.99	6.29	.393
17	5.50	6.99	6.29	.370
18	5.50	6.99	6.29	.349
19	5.50	6.99	6.29	.331
20	5.50	6.99	6.29	.315
21	5.50	6.99	6.29	.300
22	5.50	6.99	6.29	.286
23	5.50	6.99	6.29	.273
24	5.50	6.99	6.29	.262
25	5.50	6.99	6.29	.252
26	5.25	6.66	6.00	.231
27	5.25	6.66	6.00	.222
28	5.25	6.66	6.00	.214
29	5.25	6.66	6.00	.207
30	5.25	6.66	6.00	.200
31	5.25	6.66	6.00	.194
32	5.25	6.66	6.00	.188
33	5.25	6.66	6.00	.182
34	5.25	6.66	6.00	.176
35	5.25	6.66	6.00	.171
36	5.125	6.51	5.86	.163
37	5.125	6.51	5.86	.157
38	5.125	6.51	5.86	.154
39	5.125	6.51	5.86	.150
40	5.00	6.34	5.71	.143
41	5.00	6.34	5.71	.139
42	5.00	6.34	5.71	.136
43	5.00	6.34	5.71	.133
44	4.75	6.03	5.43	.123
45	4.75	6.03	5.43	.121
46	4.75	6.03	5.43	.118
47	4.75	6.03	5.43	.116
48	4.50	5.72	5.15	.107
49	4.50	5.72	5.15	.105
50	4.50	5.72	5.15	.103
51	4.50	5.72	5.15	.101
52	4.25	5.40	4.86	.093
53	4.25	5.40	4.86	.091
54	4.25	5.40	4.86	.090
55	4.25	5.40	4.86	.088
56	4.25	5.40	4.86	.086
57	4.25	5.40	4.86	.085

Production Table for Self-Acting Mule.

(Concluded.)

Number of Yarn.	64-inch Stretches per Minute.	Production per day of ten hours — Calculated — Hanks per Spindle.	Actual (10 per ct. Stoppages.) — Hanks per Spindle.	Actual (10 per ct. Stoppages.) — Pounds per Spindle.
58	4.25	5.40	4.86	.084
59	4.25	5.40	4.86	.082
60	4.125	5.24	4.72	.079
61	4.125	5.24	4.72	.077
62	4.125	5.24	4.72	.076
63	4.125	5.24	4.72	.075
64	4.125	5.24	4.72	.074
65	4.125	5.24	4.72	.073
66	4.125	5.24	4.72	.072
67	4.125	5.24	4.72	.070
68	4.00	5.08	4.58	.067
69	4.00	5.08	4.58	.066
70	4.00	5.08	4.58	.065
71	4.00	5.08	4.58	.065
72	4.00	5.08	4.58	.064
73	4.00	5.08	4.58	.063
74	4.00	5.08	4.58	.062
75	4.00	5.08	4.58	.061
76	4.00	5.08	4.58	.060
77	4.00	5.08	4.58	.059
78	4.00	5.08	4.58	.059
79	4.00	5.08	4.58	.058
80	3.875	4.92	4.43	.055
81	3.875	4.92	4.43	.055
82	3.875	4.92	4.43	.054
83	3.875	4.92	4.43	.053
84	3.875	4.92	4.43	.053
85	3.875	4.92	4.43	.052
86	3.875	4.92	4.43	.052
87	3.875	4.92	4.43	.051
88	3.875	4.92	4.43	.050
89	3.875	4.92	4.43	.050
90	3.75	4.76	4.28	.048
91	3.75	4.76	4.28	.047
92	3.75	4.76	4.28	.047
93	3.75	4.76	4.28	.046
94	3.75	4.76	4.28	.046
95	3.75	4.76	4.28	.045
96	3.75	4.76	4.28	.045
97	3.75	4.76	4.28	.044
98	3.75	4.76	4.28	.044
99	3.75	4.76	4.28	.043
100	3.75	4.76	4.28	.043

Note:—The production given in the tables is sometimes exceeded by applying a "roller motion," which will deliver from 4 per cent. to 7 per cent of yarn during the inward run of the carriage, as may be desired; this increased production is generally figured at 5 per cent.

Draper's Table

of Breaking Weight of American Warp Yarns, per Skein, weight given in Pounds.

Number.	Breaking Weight.	Number.	Breaking Weight.	Number.	Breaking Weight.	Number.	Breaking Weight.
1		26	66.3	51	36.6	76	25.8
2		27	63.6	52	36.1	77	25.5
3	530.0	28	61.3	53	35.5	78	25.3
4	410.0	29	59.2	54	34.9	79	24.9
5	330.0	30	57.3	55	34.4	80	24.6
6	275.0	31	55.6	56	33.8	81	24.3
7	237.6	32	54.0	57	33.4	82	24.0
8	209.0	33	52.6	58	32.8	83	23.7
9	186.5	34	51.2	59	32.3	84	23.4
10	168.7	35	50.0	60	31.7	85	23.2
11	154.1	36	48.7	61	31.3	86	22.8
12	142.0	37	47.6	62	30.8	87	22.6
13	131.5	38	46.5	63	30.4	88	22.4
14	122.8	39	45.5	64	30.0	89	22.2
15	115.1	40	44.6	65	29.6	90	22.0
16	108.4	41	43.8	66	29.2	91	21.7
17	102.5	42	43.0	67	28.8	92	21.5
18	97.3	43	42.2	68	28.5	93	21.3
19	92.6	44	41.4	69	28.2	94	21.2
20	88.3	45	40.7	70	27.8	95	21.0
21	83.8	46	40.0	71	27.4	96	20.7
22	79.7	47	39.3	72	27.1	97	20.5
23	75.9	48	38.6	73	26.8	98	20.4
24	72.4	49	37.9	74	26.5	99	20.2
25	69.2	50	37.3	75	26.2	100	20.0

Makepeace's Table

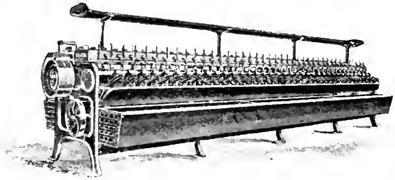
of Breaking Weight of English and American Warp Yarns, in Pounds per Skein.

No. of Yarn.	English Table.				American Table.	No. of Yarn.
	Ordinary.	Fair.	Good.	Extra.	Average Strength.	
10	119.2	124.3	128.8	134.3	170.1	10
11	103.7	105.2	107.4	110.6	158.3	11
12	99.1	99.8	102.1	104.4	144.7	12
13	92.8	95.3	97.6	99.8	132.6	13
14	91.1	92.9	94.8	96.7	122.1	14
15	85.4	86.5	88.5	91.1	116.8	15
16	82.2	84.8	86.3	88.6	110.2	16
17	77.3	79.6	81.2	83.1	104.5	17
18	73.6	74.8	76.7	78.7	98.9	18
20	68.7	70.1	71.8	73.5	89.8	20
22	62.5	64.6	65.9	66.8	80.4	22
24	58.4	60.8	61.9	63.1	73.6	24
26	54.3	56.4	57.8	59.2	67.9	26
28	50.6	51.9	52.8	54.9	62.7	28
30	48.9	49.9	51.2	52.8	58.4	30
32	45.8	46.8	48.1	49.1	55.1	32
34	44.3	45.6	46.3	48.1	52.2	34
36	42.1	42.8	43.7	44.9	49.9	36
38	39.3	40.0	41.7	42.6	47.8	38
40	38.4	39.6	40.9	41.7	45.7	40
42	37.5	38.7	39.6	40.8	44.1	42
44	35.1	36.4	38.9	37.9	42.2	44
46	33.5	34.9	35.6	36.1	41.4	46
48	32.1	33.3	33.9	34.7	39.1	48
50	31.9	32.7	33.4	34.1	38.4	50
55	30.7	31.3	32.1	33.2	35.9	55
60	28.1	29.8	30.7	29.7	32.8	60
65	25.0	26.4	27.3	27.8	30.9	65
70	23.9	24.3	25.4	26.1	28.5	70
75	22.4	23.1	24.1	24.7	27.8	75
80	21.0	22.7	23.2	23.9	25.6	80
85	19.6	20.5	21.1	22.1	4.1	85
90	18.7	19.3	20.2	20.9	22.3	90
95	17.9	18.7	19.1	20.1	21.4	95
100	17.3	18.1	18.7	19.4	20.8	100

NEW MODEL SPOOLER,

Manufactured by

The Whitin Machine Works.



The accompanying cut shows clearly the general features of construction of our new Spooler. The chief departures from our former pattern are the adoption of the single rail for holding the spindle, and the entire remodeling of the spindle itself. The latter runs in a bolster with a closed bottom, and being held by the single rail, is always found to run freely, any twisting or settling of the frame not affecting the spindle, as sometimes happens when two rails are used. The bolster case, between the spindle bearings at the extreme top and bottom, is enlarged to form a chamber holding a considerable quantity of oil. The spindle is further constructed so that all oil is thrown off before reaching the top of the bolster, and is then conducted back by channels to the oil chamber, thus avoiding waste. The spindle virtually runs in a bottle, and a little oil once in a month or two will be found sufficient, there being no waste except by evaporation.

To avoid cross-banding at the end of the cylinder, two spindles are equipped with double whirls, driving from one to the other.

Whitin Spoolers, Continued.

The single rail supporting the spindles is made extra strong and heavy. Our new patent Thread Guide has the horizontal slot and is easily adjusted both for height and different opening of slot. Either adjustment is independent of the other, so that in changing, attention need be given only to the defective point. The guide is further arranged so that the slot will not be closed by an accidental blow, as from a spool. We equip the Spooler with either the Wade type of bobbin holders, or side spindles as desired. The bobbin boxes are of large capacity, and are fitted with shields to keep out dirt falling from above, or we apply brackets to receive the ordinary doffing boxes as they come from the spinning room. The wave or traverse is governed by a mangle, and on long machines is driven from both ends thus insuring a very positive and steady motion to the guides the whole length of the frame, and guaranteeing perfect spools. The wave shaft is placed high in the frame, so that the levers operating the lifting-rods are well-up from the mill floor. This prevents the breakage of the mangle by the levers striking any stray spools that may have fallen under the frame. Creel and trough are made conveniently for storing empty and full spools. The driving pulley is provided with shipper-fork for both overhead and underneath belts.

Floor Space:—Width 4′ and 2″ and lengths as per table on next page.

The lengths given are outside of driving pulleys.

Driving Pulleys are 10″ diameter, 2½″ face, and run from 160 to 260 revolutions per minute.

Whitin Spoolers, Continued.

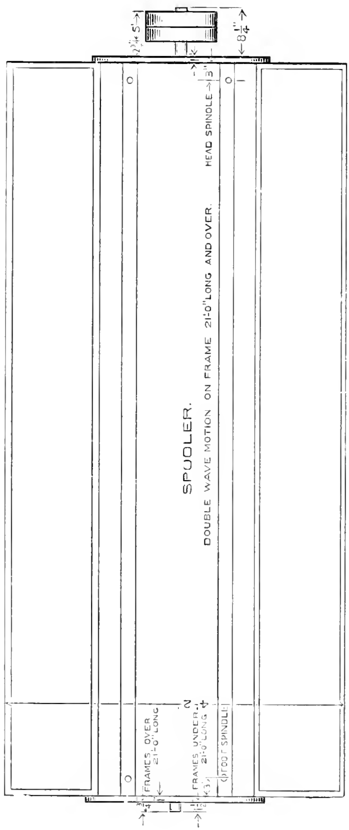
Spooler.

Floor Space.

No. of Spindles	3½ in. Space.		3¾ in. Space.		4 in. Space.		4¼ in. Space.		4½ in. Space.		4¾ in. Space.		5 in. Space.		5¼ in. Space.		5½ in. Space.		5¾ in. Space.		6 in. Space.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
40	7	¼	7	5	7	9¾	8	2½	8	7¼	9	0	9	4¾	9	9½	10	2¼	10	7	10	11¾
50	8	5¾	8	11¾	9	5¾	9	11¾	10	5¾	10	11¾	11	5¾	11	11¾	12	5¾	12	11¾	13	5¾
60	9	11¼	10	6½	11	1¾	11	9	12	4¼	12	11½	13	6¾	14	2	14	9¼	15	4½	15	11¾
70	11	4¾	12	1¼	12	9¾	13	6¼	14	2¾	14	11¼	15	7¾	16	4¼	17	¾	17	9¼	18	5¾
80	12	10¼	13	8	14	5¾	15	3½	16	1¼	16	11	17	8¾	18	6½	19	4¼	20	2	20	11¾
90	14	3¾	15	2¾	16	1¾	17	¾	17	11¾	18	10¾	19	9¾	20	8¾	21	9	22	8	23	7
100	15	9¼	16	9½	17	9¾	18	10	19	10¼	20	10½	22	0	23	¼	24	½	25	¾	26	1
110	17	2¾	18	4¼	19	5¾	20	7¼	21	10	22	11½	24	1	25	2½	26	4	27	5½	28	7
120	18	8¼	19	11	21	3	22	5¾	23	8½	24	11¼	26	2	27	4¾	28	7½	29	10¼	31	1
130	20	1¾	21	7	22	11	24	3	25	7	26	11	28	3	29	7	30	11	32	3	33	7
140	21	7¼	23	1¾	24	7	26	¼	27	5½	28	10¾	30	4	31	9¼	33	2½	34	7¾	36	1
150	23	2	24	8½	26	3	27	9½	29	4	30	10½	32	5	33	11½	35	6	37	½	38	7
160	24	7½	26	3¼	27	11	29	6¾	31	2½	32	10¼	34	6	36	1¾	37	9½	39	5¼	41	1
170	26	1	27	10	29	7	31	4	33	1	34	10	36	7	38	4	40	1	41	10	43	7
180	27	6½	29	4¾	31	3	33	1¼	34	11½	36	9¾	38	8	40	6¼	42	4½	44	2¾	46	1
190	29	0	30	11½	32	11	34	10½	36	10	38	9½	40	9	42	8½	44	8	46	7½	48	7
200	30	5½	32	6¼	34	7	36	7¾	38	8½	40	9¼	42	10	44	10¾	46	11½	49	¼	51	1

Double Wave Motion used on Frames 21', 0" and over.

Whitin Spoolers, Continued.



Floor Plan.

Whitin Spoolers, Concluded.

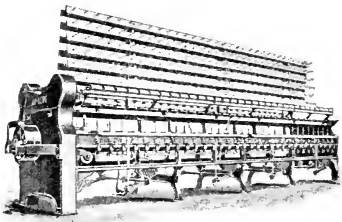
Production Table of Spooler.

Dimensions of Spools.		No. of Yarn.	Revolutions per Minute of			No. Whitin Gravity Spindles to one Spooler Spindle at 825 Rev.
			Cyl. 167, Spindle 750	Cyl. 184, Spindle 825	Cyl. 200, Spindle 900	
Length between Heads.	Diameter of Heads.		Pounds per Day per Spindle.			
		8	10.8	11.8	12.9	
		10	8.6	9.5	10.3	12
6 in.	5 in.	12	7.2	7.9	8.6	
		14	6.2	6.8	7.4	
		16	5.4	5.9	6.5	13
		18	4.8	5.3	5.8	
		20	4.3	4.8	5.2	
6 in.	4 in.	22	3.9	4.3	4.7	14
		24	3.6	4.0	4.3	
		26	3.3	3.7	4.0	
		28	3.1	3.4	3.7	15
		30	2.9	3.2	3.5	
		32	2.7	3.0	3.3	
5 in.	4 in.	34	2.6	2.8	3.1	16
		36	2.4	2.7	2.9	
		38	2.3	2.5	2.7	17
		40	2.2	2.4	2.6	18
4½ in.	3½ in.	44	2.0	2.2	2.4	19
		50	1.8	1.9	2.1	20
		60	1.5	1.6	1.8	21
3½ in.	3¼ in.	70	1.3	1.4	1.5	23
		80	1.1	1.2	1.3	25
3 in.	2¾ in.	90	1.0	1.1	1.2	27
		100	.9	1.0	1.1	30

WET AND DRY TWISTERS,

Manufactured by

The Whitin Machine Works.



This machine in its general construction closely resembles our Ring Spinning Frame. It is built with the box end enclosing gearing and outboard bearing for pulley arbor. The lifting rods run in protected bushings, and the Twister is furnished with a patented device for locking the ring rails when doffing. The gearing is machine cut, and may be arranged, at the option of the purchaser, to drive each side of the frame independent of the other, thereby producing two different twists at the same time, if desired. The Twister is arranged to twist from spools only.

The delivering rolls are built in two styles, viz: two lines of lower rolls with heavy single line of top rolls, generally used in heavy Dry twisting, and single line of lower rolls with single line of top rolls, which are used in both Dry and Water twisting.

In Water twisting the rolls are brass or brass covered, and the yarn is held under water contained in a brass trough by a glass rod, which, by a simple device, can be raised to free the yarn from the water or for cleaning.

A simple and effective knee brake is provided for each spindle, by means of which any spindle may be stopped independently of the rest, while piecing up. The traverse is 4″, 4½″, 5″, 5½″, 6″, 6½″. The spindles are driven by either 7″ or 8″ cylinders.

Driving Pulleys are 6″ to 18″ in diameter; width of face, 2″ to 3″.

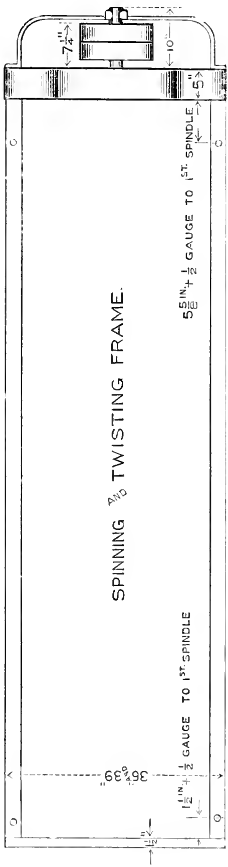
Whitin Twisters, Continued.

The New Model Twister.

Floor Space:—Widths 36 and 39 inches and lengths over all for Standard Frames, as follows:

No. of Spindles	6 in. Space.		$5\frac{1}{2}$ in. Space.		5 in. Space.		$4\frac{1}{2}$ in. Space.		4 in. Space.		$3\frac{1}{2}$ in. Space.		$3\frac{1}{4}$ in. Space.		3 in. Space		$2\frac{3}{4}$ in. Space.		$2\frac{1}{2}$ in. Space.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	ft.	in	ft.	in.	ft.	in.	ft.	in.	ft.	in.
60					14	6	13	3												
64	18	0	16	8					12	8	11	4	10	8	10	0				
72	20	0	18	6	17	0	15	6									10	3	9	6
80	22	0	20	4					15	4	13	8	12	10	12	0				
84					19	6	17	9												
88	24	0	22	2																
96	26	0	24	0	22	0	20	0	18	0	16	0	15	0	14	0	13	0	12	0
104	28	0	25	10																
108					24	6	22	3												
112			27	8					20	8	18	4	17	2	16	0				
120					27	0	24	6									15	9	14	6
128									23	4	20	8	19	4	18	0				
132					29	6	26	9												
144							29	0	26	0	23	0	21	6	20	0	18	6	17	0
160									28	8	25	4	23	8	22	0				
168																	21	3	19	6
176									31	4	27	8	25	10	24	0				
192											30	0	28	0	26	0	24	0	22	0
208													30	2	28	0				
216																	26	9	24	6
224															30	0				
240																	29	6	27	0

Whitin Twisters, Continued.



Floor Plan.

Whitin Twisters, Continued.

Twister Change Twist Gear Tables.

Cylinder 7 in. Diameter. Whirl $\frac{7}{8}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 7.25.

Change Gear.	Cyl. 22T.	Stud 88T.	Cyl. 36T.	Stud 74T.	Cyl. 55T.	Stud 55T.
	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
15	48.32	45.93	24.83	23.60	12.08	11.48
16	45.30	43.06	23.28	22.14	11.02	10.76
17	42.63	40.53	21.91	20.83	10.66	10.13
18	40.27	38.28	20.69	19.67	10.07	9.57
19	38.15	36.26	19.60	18.63	9.54	9.06
20	36.24	34.44	18.62	17.70	9.06	8.61
21	34.51	32.81	17.74	16.86	8.63	8.20
22	32.95	31.32	16.93	16.08	8.24	7.83
23	31.51	29.96	16.19	15.35	7.88	7.49
24	30.20	28.71	15.52	14.75	7.55	7.18
25	28.99	27.56	14.90	14.16	7.25	6.89
26	27.88	26.50	14.33	13.62	6.97	6.62
27	26.84	25.52	13.79	13.11	6.71	6.38
28	25.89	24.61	13.30	12.66	6.47	6.15
29	24.99	23.75	12.84	12.21	6.25	5.94
30	24.16	22.96	12.41	11.80	6.04	5.74
31	23.38	22.22	12.01	11.42	5.84	5.55
32	22.65	21.53	11.64	11.06	5.66	5.38
33	21.96	20.88	11.28	10.73	5.49	5.22
34	21.32	20.26	10.95	10.41	5.33	5.06
35	20.71	19.68	10.64	10.11	5.18	4.92
36	20.13	19.13	10.34	9.84	5.03	4.78
37	19.59	18.62	10.06	9.57	4.90	4.65
38	19.07	18.13	9.80	9.32	4.77	4.53
39	18.58	17.69	9.55	9.08	4.64	4.42
40	18.12	17.22	9.31	8.85	4.53	4.30
41	17.68	16.80	9.08	8.63	4.42	4.20
42	17.26	16.40	8.87	8.43	4.31	4.10
43	16.85	16.02	8.66	8.23	4.21	4.00
44	16.47	15.66	8.46	8.04	4.12	3.91
45	16.11	15.33	8.27	7.86	4.03	3.83
46	15.76	14.98	8.09	7.69	3.94	3.74
47	15.42	14.66	7.92	7.53	3.85	3.66
48	15.10	14.35	7.76	7.37	3.77	3.59
49	14.79	14.06	7.60	7.22	3.70	3.51
50	14.49	13.78	7.45	7.08	3.62	3.44
51	14.21	13.51	7.30	6.94	3.55	3.38
52	13.94	13.25	7.16	6.81	3.48	3.31
53	13.67	13.00	7.03	6.68	3.42	3.25
54	13.42	12.76	6.90	6.55	3.35	3.19
55	13.18	12 54	6.77	6.44	3.29	3.13
56	12.94	12.30	6.65	6.32	3.23	3.07
57	12.72	12 10	6.53	6.21	3.18	3.02
58	12.50	11.88	6.42	6.10	3.12	2.97
59	12.28	11.69	6.31	6.00	3.07	2.92
60	12.08	11.48	6.21	5.90	3.02	2.87

Gravity Twisting Spindle, Weight $9\frac{1}{2}$ oz.

Whitin Twisters, Continued.

Twister Change Twist Gear Tables.

Cylinder 7 in. Diameter. Whirl $1\frac{5}{16}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 4.80.

Change Gear.	Cyl. 22T.	Stud 88T.	Cyl. 36T.	Stud 74T.	Cyl. 55T.	Stud 55T.
	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
15	32.00	30.41	16.44	15.63	8.00	7.60
16	30.00	28.51	15.41	14.65	7.50	7.13
17	28.23	26.83	14.50	13.79	7.06	6.71
18	26.66	25.34	13.70	13.02	6.67	6.33
19	25.26	24.01	12.98	12.34	6.32	6.00
20	24.00	22.80	12.33	11.72	6.00	5.70
21	22.85	21.72	11.74	11.16	5.71	5.43
22	21.81	20.73	11.21	10.66	5.45	5.18
23	20.86	19.83	10.72	10.19	5.22	4.96
24	20.00	19.01	10.28	9.77	5.00	4.75
25	19.20	18.24	9.86	9.38	4.80	4.56
26	18.46	17.54	9.49	9.02	4.61	4.38
27	17.77	16.89	9.13	8.68	4.44	4.22
28	17.14	16.29	8.81	8.37	4.29	4.07
29	16.55	15.73	8.50	8.08	4.14	3.93
30	16.00	15.20	8.22	7.81	4.00	3.80
31	15.48	14.71	7.96	7.56	3.87	3.68
32	15.00	14.27	7.70	7.33	3.75	3.57
33	14.54	13.82	7.47	7.10	3.64	3.45
34	14.11	13.41	7.25	6.89	3.53	3.35
35	13.71	13.03	7.05	6.70	3.43	3.26
36	13.33	12.67	6.85	6.51	3.33	3.17
37	12.97	12.33	6.67	6.33	3.24	3.08
38	12.63	12.00	6.49	6.17	3.16	3.00
39	12.30	11.68	6.32	6.01	3.08	2.92
40	12.00	11.40	6.16	5.86	3.00	2.85
41	11.70	11.13	6.01	5.72	2.93	2.78
42	11.42	10.87	5.87	5.58	2.86	2.72
43	11.16	10.61	5.73	5.45	2.79	2.65
44	10.90	10.34	5.60	5.33	2.73	2.58
45	10.66	10.13	5.48	5.21	2.67	2.53
46	10.43	9.92	5.36	5.09	2.61	2.48
47	10.21	9.71	5.25	4.99	2.55	2.43
48	10.00	9.50	5.14	4.88	2.50	2.37
49	9.79	9.31	5.03	4.78	2.45	2.33
50	9.60	9.12	4.93	4.69	2.40	2.28
51	9.41	8.95	4.83	4.60	2.35	2.24
52	9.23	8.77	4.74	4.51	2.31	2.19
53	9.05	8.61	4.65	4.43	2.26	2.15
54	8.88	8.45	4.57	4.34	2.22	2.11
55	8.72	8.30	4.48	4.27	2.18	2.08
56	8.57	8.14	4.40	4.19	2.14	2.03
57	8.42	8.01	4.33	4.12	2.11	2.00
58	8.27	7.86	4.25	4.04	2.07	1.96
59	8.13	7.74	4.18	3.98	2.03	1.93
60	8.00	7.60	4.11	3.91	2.00	1.90

Heavy Gravity Twisting Spindle, weight $13\frac{1}{4}$ oz. Extra Heavy 15 oz.

Whitin Twisters, Continued.

Twister Change Twist Gear Tables.

Cylinder 8 in. Diameter. Whirl $\frac{7}{8}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 8.28.

Change Gear.	Cyl. 22T. Stud 88T.		Cyl. 36T. Stud 74T.		Cyl. 55T. Stud 55T.	
	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear	$1\frac{3}{8}$ in. Roll 108T. Gear	$1\frac{1}{2}$ in. Roll 112T. Gear
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
15	55.18	52.46	28.36	26.96	13.79	13.11
16	51.73	49.18	26.58	25.27	12.93	12.29
17	48.70	46.28	25.02	23.78	12.17	11.57
18	45.98	43.71	23.63	22.46	11.49	10.93
19	43.56	41.41	22.38	21.28	10.89	10.35
20	41.38	39.34	21.27	20.21	10.34	9.83
21	39.41	37.47	20.25	19.25	9.85	9.37
22	37.62	35.77	19.34	18.38	9.41	8.94
23	35.99	34.21	18.49	17.58	9.00	8 55
24	34.49	32.78	17.72	16.85	8.62	8.19
25	33.11	31.47	17.01	16.17	8.28	7.87
26	31.84	30.26	16.36	15.55	7.96	7.56
27	30.66	29.14	15.75	14.98	7.66	7.28
28	29.56	28.10	15.19	14.44	7.39	7.02
29	28.54	27.13	14.67	13.94	7.13	6.78
30	27.59	26.23	14.18	13.47	6.90	6.56
31	26.70	25.38	13.72	13.04	6.68	6.34
32	25.87	24.59	13.29	12.64	6.47	6.15
33	25.08	23.84	12.89	12.25	6.27	5.96
34	24 34	23.14	12.51	11.89	6.08	5.78
35	23.65	22.48	12.15	11.55	5.91	5.62
36	22.99	21.86	11.81	11.23	5.75	5.46
37	22.37	21.26	11.49	10.93	5.59	5.31
38	21.78	20.71	11.19	10.64	5.44	5.18
39	21.22	20.17	10.91	10.36	5.30	5.04
40	20.69	19.67	10.63	10.11	5.17	4.92
41	20.19	19.19	10.37	9.86	5.05	4.80
42	19.71	18.73	10.12	9.63	4.93	4.68
43	19.25	18.34	9.89	9.40	4.81	4.58
44	18.81	17.88	9.67	9.19	4.70	4.47
45	18.39	17.48	9.45	8.98	4.60	4.37
46	17.99	17.11	9.25	8.79	4.50	4.28
47	17.61	16.74	9.05	8.60	4.40	4.18
48	17.24	16.39	8.86	8.42	4.31	4.10
49	16.89	16.06	8.68	8.25	4.22	4.01
50	16.55	15.73	8.51	8.09	4.14	3.93
51	16.23	15.44	8.34	7.93	4.06	3.86
52	15.92	15.13	8.18	7.77	3.98	3.78
53	15.62	14.86	8.02	7.64	3.90	3.71
54	15.31	14.57	7.88	7.49	3.83	3.64
55	15.05	14.32	7.73	7.36	3.76	3.58
56	14.78	14.05	7.59	7.22	3.69	3.51
57	14.52	13.82	7.46	7.10	3.63	3.45
58	14.27	13.56	7.33	6.97	3.57	3.39
59	14.03	13.35	7.21	6.86	3.51	3.34
60	13.80	13.11	7.09	6.74	3.45	3.28

Gravity Twisting Spindle, Weight $9\frac{1}{2}$ oz.

Whitin Twisters, Continued.

Twister Change Twist Gear Tables.

Cylinder 8 in. Diameter. Whirl $1\frac{5}{16}$ in. Diameter.
Speed Ratio of Cylinder to Whirl 1 to 5.48.

Change Gear.	Cyl. 22T. $1\frac{3}{8}$ in. Roll 108T.Gear	Stud 88T. $1\frac{1}{2}$ in. Roll 112T.Gear	Cyl. 36T. $1\frac{3}{8}$ in. Roll 108T.Gear	Stud 74T. $1\frac{1}{2}$ in. Roll 112T.Gear	Cyl. 55T. $1\frac{3}{8}$ in. Roll 108T.Gear	Stud 55T. $1\frac{1}{2}$ in. Roll 112T.Gear
	Twist.	Twist.	Twist.	Twist.	Twist.	Twist.
15	36.53	34.72	18.77	17.84	9.13	8.68
16	34.25	32.55	17.60	16.73	8.56	8.14
17	32.23	30.63	16.56	15.74	8.06	7.66
18	30.44	28.93	15.64	14.86	7.61	7.24
19	28.84	27.41	14.82	14.08	7.21	6.85
20	27.40	26.04	14.08	13.38	6.85	6.51
21	26.09	24.79	13.41	12.74	6.52	6.20
22	24.90	23.67	12.80	12.16	6.22	5.92
23	23.82	22.64	12.24	11.64	5.95	5.66
24	22.83	21.69	11.73	11.15	5.71	5.42
25	21.92	20.83	11.26	10.71	5.48	5.21
26	21.07	20.03	10.83	10.29	5.27	5.01
27	20.29	19 29	10.43	9.91	5.06	4.82
28	19.57	18.60	10.06	9.56	4.89	4.65
29	18.89	17.95	9.71	9.21	4.72	4.49
30	18.26	17.35	9.38	8.92	4.56	4.34
31	17.67	16.80	9.08	8.63	4.42	4.20
32	17.12	16.28	8.80	8.36	4.28	4.07
33	16.60	15.78	8.53	8.11	4.15	3.94
34	16.11	15.31	8.28	7.86	4.03	3.83
35	15.65	14.88	8.04	7.65	3.91	3.72
36	15.22	14.46	7.82	7.43	3.80	3.61
37	14.81	14.07	7.61	7.23	3.70	3.52
38	14.42	13.70	7.41	7 04	3.60	3.42
39	14.05	13.35	7.22	6.86	3.51	3.34
40	13.70	13.02	7.04	6.69	3.42	3.25
41	13.36	12.70	6.87	6.53	3.34	3.17
42	13.04	12.40	6.70	6.37	3.26	3.10
43	12.74	12.11	6.55	6.22	3.18	3.03
44	12.45	11.83	6.40	6.08	3.11	2.96
45	12.17	11.57	6.25	5.95	3.04	2.89
46	11.91	11.32	6.12	5.82	2.98	2.83
47	11.65	11.08	5.99	5.69	2.91	2.77
48	11.41	10.85	5.86	5.57	2.85	2.71
49	11.18	10.63	5.74	5.46	2.79	2.66
50	10.96	10.41	5.63	5.35	2.74	2.60
51	10.74	10.22	5.52	5.25	2.68	2.56
52	10.53	10.01	5.41	5.15	2.63	2.50
53	10.34	9.83	5.31	5.05	2.58	2.46
54	10.14	9.65	5.21	4.96	2.53	2.41
55	9.96	9.48	5.12	4.87	2.49	2.37
56	9.78	9.30	5.03	4.78	2.44	2.32
57	9.61	9.14	4.94	4.70	2.40	2.29
58	9.44	8.98	4.85	4.62	2.36	2.24
59	9.28	8.83	4.77	4.54	2.32	2.21
60	9.13	8.66	4.69	4.46	2.28	2.16

Heavy Gravity Twisting Spindle, weight $13\frac{1}{4}$ oz. Extra Heavy 15 oz.

Whitin Twisters, Continued.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—2 Ply.

No of Yarn to be Twisted.	Rev of Spindle per Minute.	Multiplier 4. Rev. per Min. 1 3/8″ Roll	Multiplier 4. Rev. per Min. 1 1/2″ Roll	Multiplier 4. Pounds per Spindle	Multiplier 5. Rev. per Min. 1 3/8″ Roll	Multiplier 5. Rev. per Min. 1 1/2″ Roll	Multiplier 5. Pounds per Spindle.	Multiplier 6. Rev. per Min. 1 3/8″ Roll	Multiplier 6. Rev. per Min. 1 1/2″ Roll	Multiplier 6. Pounds per Spindle.	Space of Frame in Inches	Dia. of Ring in Inches
6	4500	150.3	137.8	3.97	120.3	110.3	3.18	100.3	91.9	2.65	4	3
7	4750	147.0	134.8	3.33	117.6	107.8	2.67	98.0	89.8	2.22		
8	5000	144.7	132.6	2.87	115.7	106.1	2.29	96.4	88.4	1.91		
9	5200	141.8	130.0	2.50	113.4	104.0	2.01	94.6	86.7	1.67		
10	5300	137.2	125.8	2.18	109.7	100.6	1.75	91.4	83.8	1.46		
11	5500	135.8	124.5	1.96	108.5	99.5	1.57	90.5	83.0	1.30		
12	5500	130.0	119.1	1.71	103.9	95.2	1.38	86.6	79.4	1.15		
13	5650	128.2	117.5	1.57	102.6	94.1	1.25	85.5	78.4	1.05	3½	2½
14	5750	125.8	115.3	1.43	100.6	92.2	1.14	83.9	76.9	0.96		
15	5900	124.7	114.3	1.31	99.8	91.5	1.06	83.0	76.1	0.88		
16	6000	122.8	112.6	1.22	98.2	90.0	0.98	81.8	75.0	0.81		
17	6000	119.1	109.2	1.12	95.2	87.3	0.89	79.4	72.8	0.74	3¼	2¼
18	6050	116.6	106.9	1.03	93.5	85.7	0.82	77.8	71.3	0.69		
19	6100	114.5	105.0	0.96	91.6	84.0	0.77	76.4	70.0	0.64		
20	6150	112.5	103.1	0.91	90.0	82.5	0.73	75.0	68.8	0.60		
22	6300	109.9	100.7	0.80	87.9	80.6	0.64	73.3	67.2	0.54		
24	6500	108.5	99.5	0.73	86.8	79.6	0.58	72.4	66.4	0.49		
26	6650	106.7	97.8	0.66	85.4	78.3	0.53	71.2	65.3	0.44		
28	6800	105.1	96.3	0.60	84.1	77.1	0.48	70.1	64.3	0.40		
30	6900	103.0	94.4	0.55	82.4	75.5	0.44	68.7	63.0	0.37	3	2
32	7000	101.3	92.9	0.51	81.0	74.3	0.41	67.6	62.0	0.34		
34	7000	98.2	90.0	0.46	78.5	72.0	0.37	65.5	60.0	0.31		
36	7000	95.5	87.5	0.42	76.4	70.0	0.34	63.6	58.3	0.29		
38	7000	92.9	85.2	0.39	74.3	68.1	0.32	61.9	56.7	0.26		
40	7000	90.6	83.1	0.37	72.5	66.5	0.30	60.4	55.4	0.24		
50	7500	86.8	79.6	0.28	69.4	63.6	0.22	57.9	53.1	0.19		
60	7500	79.2	72.6	0.22	63.4	58.1	0.17	52.8	48.4	0.15	2¾	1¾
70	7500	73.4	67.3	0.18	58.7	53.8	0.14	48.9	44.8	0.12		

Allowance has been made for waste, cleaning, oiling and doffing.

Whitin Twisters, Continued.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—3 Ply.

No of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4. Rev. per Min. $1\frac{3}{8}$''Roll	Multiplier 4. Rev. per Min. $1\frac{1}{2}$''Roll	Multiplier 4. Pounds per Spindle	Multiplier 5. Rev. per Min. $1\frac{3}{8}$''Roll	Multiplier 5. Rev. per Min. $1\frac{1}{2}$''Roll	Multiplier 5. Pounds per Spindle.	Multiplier 6. Rev. per Min. $1\frac{3}{8}$''Roll	Multiplier 6. Rev. per Min. $1\frac{1}{2}$''Roll	Multiplier 6. Pounds per Spindle.	Space of Frame in Inches	Dia. of Ring in Inches
6	4000	163.6	150.0	6.48	130.9	120.0	5.18	109.1	100.0	4.33	4½	3½
7	4300	162.9	149.3	5.54	130.3	119.4	4.43	108.6	99.6	3.69		
8	4550	161.2	147.8	4.80	129.1	118.3	3.83	107.5	98.5	3.20		
9	4800	160.4	147.0	4.23	128.3	117.6	3.38	106.9	98.0	2.82		
10	5000	158.6	145.4	3.77	126.7	116.2	3.02	105.7	96.9	2.51		
11	5200	157.1	144.0	3.39	125.8	115.3	2.71	104.8	96.1	2.26		
12	5350	154.8	141.9	3.07	123.8	113.5	2.46	103.2	94.6	2.05		
13	5500	152.8	140.1	2.80	122.3	112.1	2.24	101.9	93.4	1.87	4	3
14	5600	150.0	137.5	2.54	120.0	110.0	2.03	100.0	91.7	1.69		
15	5750	148.8	136.4	2.36	119.0	109.1	1.89	99.2	90.9	1.57		
16	5850	146.6	134.4	2.18	117.2	107.4	1.74	97.7	89.6	1.45		
17	5850	142.2	130.4	1.99	113.8	104.3	1.59	94.8	86.9	1.33		
18	5950	140.5	128.8	1.86	112.4	103.0	1.49	93.7	85.9	1.24		
19	6000	137.9	126.4	1.72	110.4	101.2	1.38	92.0	84.3	1.15		
20	6000	134.5	123.3	1.60	107.6	98.6	1.28	89.7	82.2	1.07	3½	2½
22	6000	128.2	117.5	1.39	102.5	94.0	1.12	85.5	78.4	0.93		
24	6000	122.8	112.6	1.22	98.2	90.0	0.98	81.9	75.1	0.81		
26	6100	120.1	110.1	1.09	95.9	87.9	0.87	80.0	73.3	0.73		
28	6250	118.4	108.5	1.01	94.7	86.8	0.81	78.9	72.3	0.67		
30	6400	117.1	107.3	0.94	93.7	85.9	0.75	78.1	71.6	0.63	3¼	2¼
32	6500	115.2	105.6	0.86	92.1	84.4	0.69	76.8	70.4	0.57		
34	6500	111.8	102.5	0.79	89.4	82.0	0.63	74.5	68.3	0.53		
36	6500	108.5	99.5	0.73	86.9	79.7	0.58	72.4	66.4	0.49		
38	6500	105.6	96.8	0.67	84.5	77.5	0.54	70.5	64.6	0.45		
40	6500	102.9	94.3	0.62	82.4	75.5	0.50	68.7	63.0	0.41	3	2
50	7000	99.2	90.9	0.47	79.3	72.8	0.38	66.2	60.7	0.31	2¾	1¾
60	7000	90.5	83.0	0.37	72.5	66.5	0.30	60.4	55.4	0.25		
70	7000	83.8	76.8	0.30	67.1	61.5	0.24	55.9	51.2	0.20		

Allowance has been made for waste, cleaning, oiling and doffing.

Whitin Twisters, Continued.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—4 Ply.

No. of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4. Rev. per Min. $1\frac{3}{8}$''Roll	Multiplier 4. Rev. per Min. $1\frac{1}{2}$''Roll	Multiplier 4. Pounds per Spindle.	Multiplier 5. Rev. per Min. $1\frac{3}{8}$''Roll	Multiplier 5. Rev. per Min. $1\frac{1}{2}$''Roll	Multiplier 5. Pounds per Spindle.	Multiplier 6. Rev. per Min. $1\frac{3}{8}$''Roll	Multiplier 6. Rev. per Min. $1\frac{1}{2}$''Roll	Multiplier 6. Pounds per Spindle	Space of Frame in Inches	Dia. of Ring in Inches
6	3700	165.3	151.5	8.73	132.3	121.3	6.98	110.2	101.0	5.82	5	4
7	3750	163.2	149.3	7.39	131.3	120.4	5.95	109.3	100.2	4.95		
8	3950	161.5	148.0	6.40	129.3	118.5	5.13	107.7	98.7	4.27		
9	4100	158.2	145.0	5.57	126.5	116.0	4.46	105.5	96.7	3.72		
10	4300	157.5	144.4	4.99	125.8	115.3	3.99	104.9	96.2	3.33		
11	4450	155.4	142.5	4.48	124.3	113.9	3.58	103.5	94.9	2.98		
12	4600	153.7	140.9	4.07	123.0	112.8	3.25	102.5	94.0	2.71		
13	4700	151.0	138.4	3.69	120.8	110.7	2.94	100.6	92.2	2.46	4½	3½
14	4800	148.5	136.1	3.36	118.8	108.9	2.69	99.0	90.8	2.24		
15	4900	146.3	134.1	3.09	117.2	107.4	2.48	97.6	89.5	2.06		
16	5000	144.7	132.6	2.87	115.7	106.1	2.29	96.4	88.4	1.91		
17	5100	143.1	131.2	2.67	114.5	105.0	2.13	95.4	87.5	1.78		
18	5200	141.7	129.9	2.50	113.4	104.0	2.00	94.5	86.6	1.67	4	3
19	5250	139.3	127.7	2.32	111.5	102.2	1.86	92.9	85.2	1.55		
20	5300	137.2	125.8	2.18	109.7	100.6	1.75	91.4	83.8	1.45		
22	5450	134.5	123.3	1.94	107.6	98.6	1.55	89.7	82.2	1.29		
24	5600	132.2	121.2	1.75	105.8	97.0	1.40	88.2	80.9	1.17		
26	5700	129.4	118.6	1.58	103.5	94.9	1.26	86.2	79.0	1.05	3½	2½
28	5800	127.0	116.4	1.44	161.5	93.0	1.15	84.6	77.6	0.96		
30	5900	124.7	114.3	1.31	99.8	91.5	1.05	83.1	76.2	0.87		
32	5950	121.8	111.7	1.21	97.4	89.3	0.97	81.2	74.4	0.81		
34	6000	119.1	109.2	1.12	95.2	87.3	0.90	79.4	72.8	0.75		
36	6050	116.7	107.0	1.03	93.4	85.6	0.82	77.8	71.3	0.69	3	2
38	6100	114.5	105.0	0.96	91.6	84.0	0.77	76.4	70.0	0.64		
40	6100	111.6	102.3	0.89	89.3	81.9	0.71	74.4	68.2	0.60		
50	6450	105.6	96.8	0.67	84.5	77.5	0.54	70.4	64.5	0.45	2¾	1¾
60	6750	100.9	92.5	0.54	80.7	74.0	0.43	67.2	61.6	0.36		
70	6900	95.4	87.5	0.41	76.4	70.0	0.35	63.6	58.3	0.29		

Allowance has been made for waste, cleaning, oiling and doffing.

Whitin Twisters, Continued.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—5 Ply.

No. of Yarn to be Twisted	Rev. of Spindle per Minute.	Multiplier 4. Rev. per Min. 1⅜''Roll	Multiplier 4. Rev. per Min. 1½''Roll	Multiplier 4. Pounds per Spindle.	Multiplier 5. Rev. per Min. 1⅜''Roll	Multiplier 5. Rev. per Min. 1½''Roll	Multiplier 5. Pounds per Spindle.	Multiplier Rev. per Min. 1⅜''Roll	Multiplier Rev. per Min. 1½''Roll	Multiplier Pounds per Spindle	Space of Frame in Inches	Dia. of Ring in Inches
6	2800	148.0	135.7	9.77	118.3	108.4	7.81	98.7	90.5	6.52	5½	4½
7	3000	146.8	134.6	8.31	117.3	107.5	6.64	97.8	89.7	5.54		
8	3150	144.1	132.1	7.13	115.4	105.8	5.71	96.1	88.1	4.75		
9	3300	142.2	130.4	6.26	113.8	104.3	5.01	94.9	87.0	4.17		
10	3400	139.1	127.5	5.51	111.3	102.0	4.41	92.7	85.0	3.67	5	4
11	3550	138.6	127.1	4.99	110.8	101.6	3.99	92.4	84.7	3.33		
12	3650	136.3	124.9	4.50	109.0	99.9	3.60	90.8	83.2	3.00		
13	3750	134.6	123.4	4.10	107.7	98.7	3.29	89.8	82.3	2.73		
14	3800	131.5	120.5	3.72	105.1	96.3	2.98	87.6	80.3	2.48		
15	3900	130.3	119.4	3.44	104.3	95.6	2.75	86.8	79.6	2.29		
16	3950	127.7	117.1	3.16	102.2	93.7	2.53	85.2	78.1	2.11		
17	4000	125.5	115.0	2.93	100.4	92.0	2.34	83.7	76.7	1.95		
18	4050	123.5	113.2	2.72	98.8	90.6	2.18	82.4	75.5	1.81		
19	4100	121.7	111.6	2.54	97.3	89.2	2.03	81.1	74.3	1.70		
20	4150	120.1	110.1	2.38	96.1	88.1	1.90	80.1	73.4	1.59	4½	3½
22	4200	116.2	106.5	2.09	92.7	85.0	1.67	77.2	70.8	1.39		
24	4300	113.6	104.1	1.88	90.9	83.3	1.50	75.7	69.4	1.25		
26	4350	110.4	101.2	1.68	88.3	80.9	1.34	73.6	67.5	1.12		
28	4400	107.6	98.6	1.52	86.1	78.9	1.22	71.7	65.6	1.01		
30	4500	106.3	97.4	1.41	85.1	78.0	1.13	70.9	65.0	0.94		
32	4550	104.1	95.4	1.29	83.3	76.4	1.03	69.4	63.6	0.86		
34	4600	102.1	93.6	1.19	81.7	74.9	0.95	68.0	62.3	0.79		
36	4600	99.2	90.9	1.09	79.4	72.8	0.87	66.1	60.6	0.73	4	3
38	4600	96.6	88.7	1.01	77.3	70.9	0.81	64.4	59.0	0.67		
40	4600	94.1	86.3	0.93	75.3	69.0	0.74	62.7	57.5	0.62		
50	4900	89.7	82.2	0.72	71.7	65.7	0.58	59.8	54.8	0.48		
60	5200	86.8	79.6	0.58	69.5	63.7	0.46	57.9	53.1	0.39	3½	2½
70	5450	84.3	77.3	0.48	67.4	61.8	0.38	56.2	51.5	0.32		

Allowance has been made for waste, cleaning, oiling and doffing.

Whitin Twisters, Continued.

Table Showing Number Pounds Twisted Yarn Produced in Ten Hours.—6 Ply.

No of Yarn to be Twisted.	Rev. of Spindle per Minute.	Multiplier 4.			Multiplier 5.			Multiplier 6.			Space of Frame in Inches	Dia. of Ring in Inches
		Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.	Rev. per Min.		Pounds per Spindle.		
		$1\frac{3}{8}$''Roll	$1\frac{1}{2}$''Roll		$1\frac{3}{8}$''Roll	$1\frac{1}{2}$''Roll		$1\frac{3}{8}$''Roll	$1\frac{1}{2}$''Roll			
6	2400	138.9	127.3	11.00	111.1	101.8	8.80	92.6	84.9	7.34	5½	4½
7	2550	136.7	125.3	9.28	109.3	100.2	7.42	91.1	83.5	6.19		
8	2700	135.3	124.0	8.04	108.4	99.4	6.44	90.2	82.7	5.36		
9	2850	134.6	123.4	7.13	107.8	98.8	5.70	89.8	82.3	4.75		
10	2950	132.3	121.3	6.29	105.9	97.1	5.03	88.1	80.8	4.19	5	4
11	3050	130.3	119.4	5.64	104.3	95.6	4.51	86.9	79.7	3.76		
12	3150	128.8	118.1	5.10	103.1	94.5	4.08	85.9	78.7	3.40		
13	3250	127.7	117.6	4.68	102.2	93.7	3.74	85.2	78.1	3.12		
14	3350	126.9	116.3	4.31	101.5	93.0	3.45	84.6	77.6	2.88		
15	3450	126.4	115.9	4.00	101.0	92.6	3.20	84.2	77.2	2.67		
16	3550	125.8	115.3	3.74	100.7	92.3	2.99	83.9	76.9	2.49		
17	3600	123.8	113.5	3.46	99.0	90.8	2.77	82.5	75.6	2.31		
18	3650	121.9	111.7	3.23	97.6	89.5	2.58	81.3	74.5	2.15		
19	3700	120.3	110.3	3.01	96.2	88.2	2.41	80.2	73.5	2.01		
20	3750	118.9	109.0	2.83	95.1	87.2	2.26	79.3	72.7	1.88	4½	3½
22	3850	116.3	106.6	2.51	93.1	85.3	2.01	77.6	71.1	1.68		
24	4000	115.7	106.1	2.30	92.6	84.9	1.84	77.2	70.8	1.53		
26	4050	112.5	103.1	2.06	90.1	82.6	1.05	75.1	68.8	1.38		
28	4100	109.8	100.6	1.86	87.9	80.6	1.49	73.2	67.1	1.24		
30	4150	107.4	98.5	1.70	85.9	78.7	1.36	71.6	65.6	1.13	4	3
32	4200	105.2	96.4	1.56	84.2	77.2	1.25	70.1	64.3	1.04		
34	4200	102.1	93.6	1.43	81.7	74.9	1.14	68.1	62.4	0.95		
36	4250	100.4	92.0	1.32	80.3	73.6	1.06	66.9	61.3	0.88		
38	4250	97.7	89.6	1.23	78.2	71.7	0.98	65.2	59.8	0.82	3½	2½
40	4[illegible]50	93.4	85.6	1.14	76.2	69.9	0.91	63.5	58.2	0.76		
50	4550	91.2	83.6	0.87	73.0	66.9	0.70	60.8	55.7	0.58		
60	4750	86.9	79.7	0.70	69.5	63.7	0.56	58.0	53.2	0.47		
70	4950	83.9	76.9	0.58	67.1	61.5	0.46	55.9	51.2	0.38	3	2

Allowance has been made for waste, cleaning, oiling and doffing.

Whitin Twisters, Continued.

Twist Tables for Twisting Yarns.

Two Ply.

No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by			No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by		
			4	5	6				4	5	6
1	.5	.7071	2.83	3.54	4.24	51	25.5	5.0498	20.20	25.25	30.30
2	1.	1.	4.	5.	6.	52	26.	5.0990	20.40	25.50	30.59
3	1.5	1.2247	4.90	6.12	7.35	53	26.5	5.1478	20.59	25.74	30.89
4	2.	1.4142	5.66	7.07	8.49	54	27.	5.1962	20.78	25.98	31.18
5	2.5	1.5811	6.32	7.91	9.49	55	27.5	5.2440	20.98	26.22	31.46
6	3.	1.7321	6.93	8.66	10.39	56	28.	5.2915	21.17	26.46	31.75
7	3.5	1.8708	7.48	9.35	11.22	57	28.5	5.3385	21.35	26.69	32.03
8	4.	2.	8.	10.	12.	58	29.	5.3852	21.54	26.93	32.31
9	4.5	2.1213	8.49	10.61	12.73	59	29.5	5.4314	21.73	27.16	32.59
10	5.	2.2361	8.94	11.18	13.42	60	30.	5.4772	21.91	27.39	32.86
11	5.5	2.3452	9.38	11.73	14.07	61	30.5	5.5227	22.09	27.61	33.14
12	6.	2.4495	9.80	12.25	14.70	62	31.	5.5678	22.27	27.84	33.41
13	6.5	2.5495	10.20	12.75	15.30	63	31.5	5.6125	22.45	28.06	33.67
14	7.	2.6458	10.58	13.23	15.87	64	32.	5.6569	22.63	28.28	33.94
15	7.5	2.7386	10.95	13.69	16.43	65	32.5	5.7009	22.80	28.50	34.21
16	8.	2.8284	11.31	14.14	16.97	66	33.	5.7446	22.98	28.72	34.47
17	8.5	2.9155	11.66	14.58	17.49	67	33.5	5.7879	23.15	28.94	34.73
18	9.	3.	12.	15.	18.	68	34.	5.8310	23.32	29.15	34.99
19	9.5	3.0822	12.33	15.41	18.49	69	34.5	5.8737	23.49	29.37	35.24
20	10.	3.1623	12.65	15.81	18.97	70	35.	5.9161	23.66	29.58	35.50
21	10.5	3.2404	12.96	16.20	19.44	71	35.5	5.9582	23.83	29.79	35.75
22	11.	3.3166	13.27	16.58	19.90	72	36.	6.	24.	30.	36.
23	11.5	3.3912	13.56	16.96	20.35	73	36.5	6.0415	24.17	30.21	36.25
24	12.	3.4641	13.86	17.32	20.78	74	37.	6.0828	24.33	30.41	36.50
25	12.5	3.5355	14.14	17.68	21.21	75	37.5	6.1237	24.49	30.62	36.74
26	13.	3.6056	14.42	18.03	21.63	76	38.	6.1644		30.82	36.99
27	13.5	3.6742	14.70	18.37	22.05	77	38.5	6.2049		31.02	37.23
28	14.	3.7417	14.97	18.71	22.45	78	39.	6.2450		31.22	37.47
29	14.5	3.8079	15.23	19.04	22.85	79	39.5	6.2849		31.42	37.71
30	15.	3.8730	15.49	19.37	23.24	80	40.	6.3246		31.62	37.95
31	15.5	3.9370	15.75	19.69	23.62	81	40.5	6.3640		31.82	38.18
32	16.	4.	16.	20.	24.	82	41.	6.4031		32.02	38.42
33	16.5	4.0620	16.25	20.31	24.37	83	41.5	6.4420		32.21	38.65
34	17.	4.1231	16.49	20.62	24.74	84	42.	6.4807		32.40	38.88
35	17.5	4.1833	16.73	20.92	25.10	85	42.5	6.5192		32.60	39.12
36	18.	4.2426	16.97	21.21	25.46	86	43.	6.5574		32.79	39.34
37	18.5	4.3012	17.20	21.51	25.81	87	43.5	6.5955		32.98	39.57
38	19.	4.3589	17.44	21.79	26.15	88	44.	6.6332		33.17	39.80
39	19.5	4.4159	17.66	22.08	26.50	89	44.5	6.6708		33.35	40.02
40	20.	4.4721	17.89	22.36	26.83	90	45.	6.7082		33.54	40.25
41	20.5	4.5277	18.11	22.64	27.17	91	45.5	6.7454		33.73	40.47
42	21.	4.5826	18.33	22.91	27.50	92	46.	6.7823		33.91	40.69
43	21.5	4.6368	18.55	23.18	27.82	93	46.5	6.8191		34.10	40.91
44	22.	4.6904	18.76	23.45	28.14	94	47.	6.8557		34.28	41.13
45	22.5	4.7434	18.97	23.72	28.46	95	47.5	6.8920		34.46	41.35
46	23.	4.7958	19.18	23.98	28.77	96	48.	6.9282		34.64	41.57
47	23.5	4.8477	19.39	24.24	29.09	97	48.5	6.9642		34.82	41.79
48	24.	4.8990	19.60	24.49	29.39	98	49.	7.		35.	42.
49	24.5	4.9497	19.80	24.75	29.70	99	49.5	7.0356		35.18	42.21
50	25.	5.	20.	25.	30.	100	50.	7.0711		35.36	42.43

Whitin Twisters, Continued.

Twist Tables for Twisting Yarns.

Three Ply.

No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by 4	5	6	No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by 4	5	6
1	.33	.5774	2.31	2.89	3.46	51	17.	4.1231	16.49	20.62	24.74
2	.67	.8165	3.27	4.08	4.90	52	17.33	4.1633	16.65	20.82	24.98
3	1.	1.	4.	5.	6.	53	17.67	4.2032	16.81	21.02	25.22
4	1.33	1.1547	4.62	5.77	6.93	54	18.	4.2426	16.97	21.21	25.46
5	1.67	1.2910	5.16	6.45	7.75	55	18.33	4.2817	17.13	21.41	25.69
6	2.	1.4142	5.66	7.07	8.49	56	18.67	4.3205	17.28	21.60	25.92
7	2.33	1.5275	6.11	7.64	9.17	57	19.	4.3589	17.44	21.79	26.15
8	2.67	1.6330	6.53	8.16	9.80	58	19.33	4.3970	17.59	21.98	26.38
9	3.	1.7321	6.93	8.66	10.39	59	19.67	4.4347	17.74	22.17	26.61
10	3.33	1.8257	7.30	9.13	10.95	60	20.	4.4721	17.89	22.36	26.83
11	3.67	1.9149	7.66	9.57	11.49	61	20.33	4.5092	18.04	22.55	27.06
12	4.	2.	8.	10.	12.	62	20.67	4.5461	18.18	22.73	27.28
13	4.33	2.0817	8.33	10.41	12.49	63	21.	4.5826	18.33	22.91	27.50
14	4.67	2.1602	8.64	10.80	12.96	64	21.33	4.6188	18.48	23.09	27.71
15	5.	2.2361	8.94	11.18	13.42	65	21.67	4.6547	18.62	23.27	27.93
16	5.33	2.3094	9.24	11.55	13.86	66	22.	4.6904	18.76	23.45	28.14
17	5.67	2.3805	9.52	11.90	14.28	67	22.33	4.7258	18.90	23.63	28.35
18	6.	2.4495	9.80	12.25	14.70	68	22.67	4.7610	19.04	23.80	28.57
19	6.33	2.5166	10.07	12.58	15.10	69	23.	4.7958	19.18	23.98	28.77
20	6.67	2.5820	10.33	12.91	15.49	70	23.33	4.8305	19.32	24.15	28.98
21	7.	2.6458	10.58	13.23	15.87	71	23.67	4.8648	19.46	24.32	29.19
22	7.33	2.7080	10.83	13.54	16.25	72	24.	4.8990	19.60	24.49	29.39
23	7.67	2.7689	11.08	13.84	16.61	73	24.33	4.9329	19.73	24.66	29.60
24	8.	2.8284	11.31	14.14	16.97	74	24.67	4.9666	19.87	24.83	29.80
25	8.33	2.8868	11.55	14.43	17.32	75	25.	5.	20.	25.	30.
26	8.67	2.9439	11.76	14.72	17.66	76	25.33	5.0332		25.17	30.20
27	9.	3.	12.	15.	18.	77	25.67	5.0662		25.33	30.40
28	9.33	3.0551	12.22	15.28	18.33	78	26.	5.0990		25.50	30.59
29	9.67	3.1091	12.44	15.55	18.65	79	26.33	5.1316		25.66	30.79
30	10.	3.1623	12.65	15.81	18.97	80	26.67	5.1640		25.82	30.98
31	10.33	3.2145	12.86	16.07	19.29	81	27.	5.1962		25.98	31.18
32	10.67	3.2659	13.06	16.33	19.60	82	27.33	5.2281		26.14	31.37
33	11.	3.3166	13.27	16.58	19.90	83	27.67	5.2599		26.30	31.56
34	11.33	3.3665	13.47	16.83	20.20	84	28.	5.2915		26.46	31.75
35	11.67	3.4157	13.66	17.08	20.49	85	28.33	5.3229		26.61	31.94
36	12.	3.4641	13.86	17.32	20.78	86	28.67	5.3541		26.77	32.12
37	12.33	3.5119	14.05	17.56	21.07	87	29.	5.3852		26.93	32.31
38	12.67	3.5590	14.24	17.80	21.35	88	29.33	5.4160		27.08	32.50
39	13.	3.6056	14.42	18.03	21.63	89	29.67	5.4467		27.23	32.68
40	13.33	3.6515	14.61	18.26	21.91	90	30.	5.4772		27.39	32.86
41	13.67	3.6969	14.79	18.48	22.18	91	30.33	5.5076		27.54	33.05
42	14.	3.7417	14.97	18.71	22.45	92	30.67	5.5377		27.69	33.23
43	14.33	3.7859	15.14	18.93	22.72	93	31.	5.5678		27.84	33.41
44	14.67	3.8297	15.32	19.15	22.98	94	31.33	5.5976		27.99	33.59
45	15.	3.8730	15.49	19.36	23.24	95	31.67	5.6273		28.14	33.76
46	15.33	3.9158	15.66	19.58	23.49	96	32.	5.6569		28.28	33.94
47	15.67	3.9582	15.83	19.79	23.75	97	32.33	5.6862		28.43	34.12
48	16.	4.	16.	20.	24.	98	32.67	5.7155		28.58	34.29
49	16.33	4.0415	16.17	20.21	24.25	99	33.	5.7446		28.72	34.47
50	16.67	4.0825	16.33	20.41	24.49	100	33.33	5.7735		28.87	34.64

Whitin Twisters, Continued.

Twist Tables for Twisting Yarns.

Four Ply.

No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by			No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by		
			4	5	6				4	5	6
1	.25	.5	2.	2.5	3.	51	12.75	3.5707	14.28	17.85	21.42
2	.50	.7071	2.83	3.54	4.24	52	13.	3.6056	14.42	18.03	21.63
3	.75	.8660	3.46	4.33	5.20	53	13.25	3.6401	14.56	18.20	21.84
4	1.	1.	4.	5.	6.	54	13.50	3.6742	14.70	18.37	22.05
5	1.25	1.1180	4.47	5.59	6.71	55	13.75	3.7081	14.83	18.54	22.25
6	1.50	1.2247	4.90	6.12	7.35	56	14.	3.7417	14.97	18.71	22.45
7	1.75	1.3229	5.29	6.61	7.94	57	14.25	3.7749	15.10	18.87	22.65
8	2.	1.4142	5.66	7.07	8.49	58	14.50	3.8079	15.23	19.04	22.85
9	2.25	1.5	6.	7.5	9.	59	14.75	3.8406	15.36	19.20	23.04
10	2.50	1.5811	6.32	7.91	9.49	60	15.	3.8730	15.49	19.37	23.24
11	2.75	1.6583	6.63	8.29	9.95	61	15.25	3.9051	15.62	19.53	23.43
12	3.	1.7321	6.93	8.66	10.39	62	15.50	3.9370	15.75	19.69	23.62
13	3.25	1.8028	7.21	9.01	10.82	63	15.75	3.9686	15.88	19.84	23.81
14	3.50	1.8708	7.48	9.35	11.22	64	16.	4.	16.	20.	24.
15	3.75	1.9365	7.75	9.68	11.62	65	16.25	4.0311	16.12	20.16	24.19
16	4.	2.	8.	10.	12.	66	16.50	4.0620	16.25	20.31	24.37
17	4.25	2.0616	8.25	10.31	12.37	67	16.75	4.0927	16.37	20.46	24.56
18	4.50	2.1213	8.49	10.61	12.73	68	17.	4.1231	16.49	20.62	24.74
19	4.75	2.1794	8.72	10.90	13.08	69	17.25	4.1533	16.61	20.77	24.92
20	5.	2.2361	8.94	11.18	13.42	70	17.50	4.1833	16.73	20.92	25.10
21	5.25	2.2913	9.17	11.46	13.75	71	17.75	4.2130	16.85	21.07	25.28
22	5.50	2.3452	9.38	11.73	14.07	72	18.	4.2426	16.97	21.21	25.46
23	5.75	2.3979	9.59	11.99	14.39	73	18.25	4.2720	17.09	21.36	25.63
24	6.	2.4495	9.80	12.25	14.70	74	18.50	4.3012	17.20	21.51	25.81
25	6.25	2.5	10.	12.5	15.	75	18.75	4.3301	17.32	21.65	25.98
26	6.50	2.5495	10.20	12.75	15.30	76	19.	4.3589		21.79	26.15
27	6.75	2.5981	10.39	12.99	15.59	77	19.25	4.3875		21.94	26.32
28	7.	2.6458	10.58	13.23	15.87	78	19.50	4.4159		22.08	26.50
29	7.25	2.6926	10.77	13.46	16.16	79	19.75	4.4441		22.22	26.66
30	7.50	2.7386	10.95	13.69	16.43	80	20.	4.4721		22.36	26.83
31	7.75	2.7839	11.14	13.92	16.70	81	20.25	4.5		22.5	27.
32	8.	2.8284	11.31	14.14	16.97	82	20.50	4.5277		22.64	27.17
33	8.25	2.8723	11.49	14.36	17.23	83	20.75	4.5552		22.78	27.33
34	8.50	2.9155	11.66	14.58	17.49	84	21.	4.5826		22.91	27.50
35	8.75	2.9580	11.83	14.79	17.75	85	21.25	4.6098		23.95	27.66
36	9.	3.	12.	15.	18.	86	21.50	4.6368		23.18	27.82
37	9.25	3.0414	12.17	15.21	18.25	87	21.75	4.6637		23.32	27.98
38	9.50	3.0822	12.33	15.41	18.49	88	22.	4.6904		23.45	28.14
39	9.75	3.1225	12.49	15.61	18.73	89	22.25	4.7170		23.58	28.30
40	10.	3.1623	12.65	15.81	18.97	90	22.50	4.7434		23.72	28.46
41	10.25	3.2016	12.81	16.01	19.21	91	22.75	4.7697		23.85	28.62
42	10.50	3.2404	12.96	16.20	19.44	92	23.	4.7958		23.98	28.77
43	10.75	3.2787	13.11	16.39	19.67	93	23.25	4.8218		24.11	28.93
44	11.	3.3166	13.27	16.58	19.90	94	23.50	4.8477		24.24	29.09
45	11.25	3.3541	13.42	16.77	20.12	95	23.75	4.8734		24.37	29.24
46	11.50	3.3912	13.56	16.96	20.35	96	24.	4.8990		24.49	29.39
47	11.75	3.4278	13.71	17 14	20.57	97	24.25	4.9244		24.62	29.55
48	12.	3.4641	13.86	17.32	20.78	98	24.50	4.9497		24.75	29.70
49	12.25	3.5	14.	17.5	21.	99	24.75	4.9749		24.87	29.85
50	12.50	3.5355	14.14	17.68	21.21	100	25.	5.		25.	30.

Whitin Twisters, Continued.

Twist Tables for Twisting Yarns.

Five Ply.

No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by 4	Square root multiplied by 5	Square root multiplied by 6	No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by 4	Square root multiplied by 5	Square root multiplied by 6
1	.2	.4472	1.79	2.24	2.68	51	10.2	3.1937	12.77	15.97	19.16
2	.4	.6325	2.53	3.16	3.79	52	10.4	3.2249	12.90	16.12	19.35
3	.6	.7746	3.10	3.87	4.65	53	10.6	3.2558	13.02	16.28	19.53
4	.8	.8944	3.58	4.47	5.37	54	10.8	3.2863	13.15	16.43	19.72
5	1.	1.	4.	5.	6.	55	11.	3.3166	13.27	16.58	19.90
6	1.2	1.0954	4.38	5.48	6.57	56	11.2	3.3466	13.39	16.73	20.08
7	1.4	1.1832	4.73	5.92	7.10	57	11.4	3.3764	13.51	16.88	20.26
8	1.6	1.2649	5.06	6.32	7.59	58	11.6	3.4059	13.62	17.03	20.44
9	1.8	1.3416	5.37	6.71	8.05	59	11.8	3.4351	13.74	17.18	20.61
10	2.	1.4142	5.66	7.07	8.49	60	12.	3.4641	13.86	17.32	20.78
11	2.2	1.4832	5.93	7.42	8.90	61	12.2	3.4928	13.97	17.46	20.96
12	2.4	1.5492	6.20	7.75	9.30	62	12.4	3.5214	14.09	17.61	21.13
13	2.6	1.6125	6.45	8.06	9.67	63	12.6	3.5496	14.20	17.75	21.30
14	2.8	1.6733	6.69	8.37	10.04	64	12.8	3.5777	14.31	17.89	21.47
15	3.	1.7321	6.93	8.66	10.39	65	13.	3.6056	14.42	18.03	21.63
16	3.2	1.7889	7.16	8.95	10.73	66	13.2	3.6332	14.53	18.17	21.80
17	3.4	1.8439	7.38	9.22	11.06	67	13.4	3.6606	14.64	18.30	21.96
18	3.6	1.8974	7.59	9.49	11.38	68	13.6	3.6878	14.75	18.44	22.13
19	3.8	1.9494	7.80	9.75	11.70	69	13.8	3.7148	14.86	18.56	22.29
20	4.	2.	8.	10.	12.	70	14.	3.7417	14.97	18.71	22.45
21	4.2	2.0494	8.20	10.25	12.30	71	14.2	3.6783	15.07	18.84	22.61
22	4.4	2.0976	8.39	10.49	12.59	72	14.4	3.7948	15.18	18.97	22.77
23	4.6	2.1448	8.58	10.72	12.87	73	14.6	3.8210	15.28	19.10	22.93
24	4.8	2.1909	8.76	10.95	13.15	74	14.8	3.8471	15.38	19.24	23.08
25	5.	2.2361	8.94	11.18	13.42	75	15.	3.8730	15.49	19.37	23.24
26	5.2	2.2804	9.12	11.40	13.68	76	15.2	3.8987		19.49	23.39
27	5.4	2.3238	9.30	11.62	13.94	77	15.4	3.9243		19.62	23.55
28	5.6	2.3664	9.47	11.83	14.20	78	15.6	3.9497		19.75	23.70
29	5.8	2.4083	9.63	12.04	14.45	79	15.8	3.9749		19.87	23.85
30	6.	2.4495	9.80	12.25	14.70	80	16.	4.		20.	24.
31	6.2	2.4900	9.96	12.45	14.94	81	16.2	4.0249		20.12	24.15
32	6.4	2.5298	10.12	12.65	15.18	82	16.4	4.0497		20.25	24.30
33	6.6	2.5690	10.28	12.85	15.41	83	16.6	4.0743		20.37	24.45
34	6.8	2.6077	10.43	13.04	15.65	84	16.8	4.0988		20.49	24.59
35	7.	2.6458	10.58	13.23	15.87	85	17.	4.1231		20.62	24.74
36	7.2	2.6833	10.73	13.42	16.10	86	17.2	4.1473		20.74	24.88
37	7.4	2.7203	10.88	13.60	16.32	87	17.4	4.1713		20.86	25.03
38	7.6	2.7568	11.03	13.78	16.54	88	17.6	4.1952		20.98	25.17
39	7.8	2.7928	11.17	13.96	16.76	89	17.8	4.2190		21.10	25.31
40	8.	2.8284	11.31	14.14	16.97	90	18.	4.2426		21.21	25.46
41	8.2	2.8636	11.45	14.32	17.18	91	18.2	4.2661		21.33	25.60
42	8.4	2.8983	11.59	14.49	17.39	92	18.4	4.2895		21.45	25.74
43	8.6	2.9326	11.73	14.66	17.60	93	18.6	4.3128		21.56	25.88
44	8.8	2.9665	11.87	14.83	17.80	94	18.8	4.3359		21.68	26.02
45	9.	3.	12.	15.	18.	95	19.	4.3589		21.79	26.15
46	9.2	3.0332	12.13	15.17	18.20	96	19.2	4.3818		21.91	26.29
47	9.4	3.0659	12.26	15.33	18.49	97	19.4	4.4045		22.02	26.43
48	9.6	3.0984	12.39	15.49	18.59	98	19.6	4.4272		22.14	26.50
49	9.8	3.1305	12.52	15.65	18.78	99	19.8	4.4497		22.25	26.70
50	10.	3.1623	12.65	15.81	18.97	100	20.	4.4721		22.36	26.83

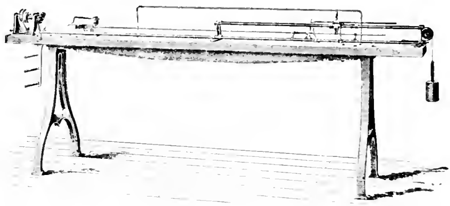
Whitin Twisters, Concluded.

Twist Tables for Twisting Yarns.

Six Ply.

No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by			No. of Yarn to be Twisted.	No. of Twisted Yarn.	Sq. root of No. Twisted Yarn.	Square root multiplied by		
			4	5	6				4	5	6
1	.17	.4082	1.63	2.04	2.45	51	8.50	2.9155	11.66	14.58	17.49
2	.33	.5774	2.31	2.89	3.46	52	8.67	2.9439	11.78	14.72	17.66
3	.50	.7071	2.83	3.54	4.24	53	8.83	2.9721	11.89	14.86	17.83
4	.67	.8165	3.27	4.08	4.90	54	9.	3.	12.	15.	18.
5	.83	.9129	3.65	4.56	5.48	55	9.17	3.0277	12.11	15.14	18.17
6	1.	1.	4.	5.	6.	56	9.33	3.0551	12.22	15.28	18.33
7	1.17	1.0801	4.32	5.40	6.48	57	9.50	3.0822	12.33	15.41	18.49
8	1.33	1.1547	4.62	5.77	6.93	58	9.67	3.1091	12.44	15.55	18.65
9	1.50	1.2247	4.90	6.12	7.35	59	9.83	3.1358	12.54	15.68	18.81
10	1.67	1.2910	5.16	6.45	7.75	60	10.	3.1623	12.65	15.81	18.97
11	1.83	1.3540	5.42	6.77	8.12	61	10.17	3.1885	12.75	15.94	19.13
12	2.	1.4142	5.66	7.07	8.49	62	10.33	3.2415	12.86	16.07	19.29
13	2.17	1.4720	5.89	7.36	8.83	63	10.50	3.2404	12.96	16.20	19.44
14	2.33	1.5275	6.11	7.64	9.17	64	10.67	3.2659	13.06	16.33	19.60
15	2.50	1.5811	6.32	7.91	9.49	65	10.83	3.2914	13.17	16.46	19.75
16	2.67	1.6330	6.53	8.16	9.80	66	11.	3.3166	13.27	16.58	19.90
17	2.83	1.6833	6.73	8.42	10.10	67	11.17	3.3417	13.37	16.71	20.05
18	3.	1.7321	6.93	8.66	10.39	68	11.33	3.3665	13.47	16.83	20.20
19	3.17	1.7795	7.12	8.90	10.68	69	11.50	3.3912	13.56	16.96	20.35
20	3.33	1.8257	7.30	9.13	10.95	70	11.67	3.4157	13.66	17.08	20.49
21	3.50	1.8708	7.48	9.35	11.22	71	11.83	3.4400	13.76	17.20	20.64
22	3.67	1.9149	7.66	9.57	11.49	72	12.	3.4641	13.86	17.32	20.78
23	3.83	1.9579	7.83	9.79	11.75	73	12.17	3.4881	13.95	17.44	20.93
24	4.	2.	8.	10.	12.	74	12.33	3.5119	14.05	17.56	21.07
25	4.17	2.0412	8.16	10.21	12.25	75	12.50	3.5355	14.14	17.68	21.21
26	4.33	2.0817	8.33	10.41	12.49	76	12.67	3.5590		17.80	21.35
27	4.50	2.1213	8.49	10.61	12.73	77	12.83	3.5824		17.91	21.49
28	4.67	2.1602	8.64	10.80	12.96	78	13.	3.6056		18.03	21.63
29	4.83	2.1985	8.79	10.99	13.19	79	13.17	3.6286		18.14	21.77
30	5.	2.2361	8.94	11.18	13.42	80	13.33	3.6515		18.26	21.91
31	5.17	2.2730	9.09	11.37	13.64	81	13.50	3.6742		18.37	22.05
32	5.33	2.3094	9.24	11.55	13.86	82	13.67	3.6969		18.48	22.18
33	5.50	2.3452	9.38	11.73	14.07	83	13.83	3.7192		18.60	22.32
34	5.67	2.3805	9.52	11.90	14.28	84	14.	3.7417		18.71	22.45
35	5.83	2.4152	9.66	12.08	14.49	85	14.17	3.7639		18.82	22.58
36	6.	2.4495	9.80	12.25	14.70	86	14.33	3.7859		18.93	22.72
37	6.17	2.4833	9.93	12.42	14.90	87	14.50	3.8079		19.04	22.85
38	6.33	2.5166	10 07	12.58	15.10	88	14.67	3.8297		19.15	22.98
39	6.50	2.5495	10.20	12.75	15.30	89	14.83	3.8514		19.26	23.11
40	6.67	2.5820	10.53	12.91	15.49	90	15.	3.8730		19.36	23.24
41	6.83	2.6141	10.46	13.07	15.68	91	15.17	3.8944		19.47	23.37
42	7.	2.6458	10.58	13.23	15.87	92	15.33	3.9158		19.58	23.49
43	7.17	2.6771	10.71	13.39	16.06	93	15.50	3.9370		19.69	23.62
44	7.33	2.7080	10.83	13.54	16.25	94	15.67	3.9582		19.79	23.75
45	7.50	2.7386	10.95	13.69	16.43	95	15.83	3.9791		19.90	23.87
46	7.67	2.7689	11.08	13.84	16.61	96	16.	4.		20.	24.
47	7.83	2.7988	11.20	13.99	16.79	97	16.17	4.0208		20.10	24.12
48	8.	2.8284	11.31	14.14	16.97	98	16.33	4.0415		20.21	24.25
49	8.17	2.8577	11.43	14.29	17.15	99	16.50	4.0620		20.31	24.37
50	8.33	2.8868	11.55	14.43	17.32	100	16.67	4.0825		20.41	24.49

THE WEEKS BANDING MACHINE.



(With Watter's Marker.)

Spindle banding is a very important matter. While it will not do to have slack yarn, the method of prevention by tying tight bands is very objectionable, for the power taken increases enormously, and the spindles are rapidly worn out. One prominent spinner uses bands as light as 230 to the pound, put on at a tension of 2½ pounds, and claims their average life to be ten months, running spindles 9400 revolutions, on 29s warp yarn, 6″ traverse, and 1¾″ rings. He advises brushing the cylinder at least every ten days to keep bands free from oil and lint, with inspection at the same time to detect slack bands, which should be cut off. These bands were made from No. 8 hank roving, using 8 strands with a core of 8 threads of No. 30 yarn. The bands were not hard twisted, about three turns per inch ; they were tied with a loop knot, and were marked.

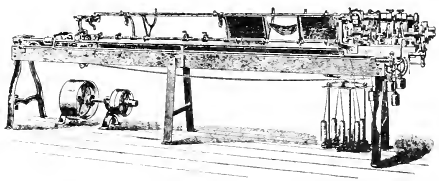
The above cut shows the Weeks Band Machine, made by the Draper Co. It is automatic in action so far as changing from twisting to doubling is concerned, and stopping itself when the band is made. It can be set for any desired amount of twist, making either a hard or soft band. It can be fitted with a Watter's Marker to automatically make a mark on the band at a definite length for the purpose of showing the band boy where the knot should be tied. By this means an even tension can be had on all the spindles.

It is usually run by a boy, and its **capacity** is 1500 bands per day, running at a **speed** of about 2000 revolutions.

The pulley is 4″ x 1⅛″.

AUTOMATIC BAND MACHINE.

(Cole Brothers.)



This is a full automatic loop banding machine. The bands are all cut off exactly the same length, and are all twisted alike, the twist being governed by cams and gears. As the bands are finished, they are taken off automatically and carried to hooks at the side of the machine, where they are all kept neatly straightened, so there is no difficulty in taking them off as wanted for use. All the changes are automatic, and closely follow each other. A good many mills are making mule bands on this machine, as the loop fastening makes them run smoother than the endless band, tied with a knot, which makes a jump in the spindle.

The **capacity** of the machine is such that it will furnish all the bands required for a 50,000 spindle mill.

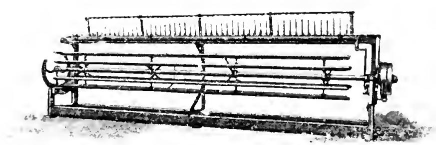
The machine occupies a **floor space** 14′–0″ long by 2′–0″ wide.

It is driven by two 1⅜″ belts from a **countershaft** driven by one 2″ belt; this countershaft is fitted with tight and loose **pulleys** 10″ x 2″, making 570 revolutions per minute.

NEW MODEL REEL,

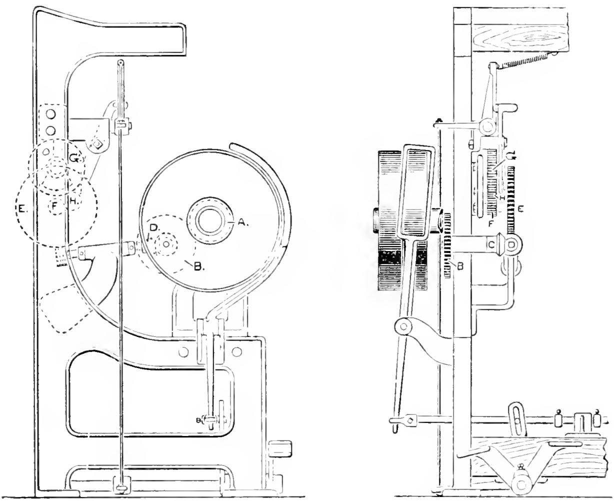
Manufactured by

The Whitin Machine Works.



The patterns for this machine have been entirely remodeled, the Reel being much lighter than formerly, and also easier running and more convenient. The "Wheel" method of doffing is employed, and by a simple device the swifts of the Reel are closed like a fan during this process. The machines are adjustable for 54″, 60″ and 72″ skeins and may be fitted with either the cross or plain traverse. Spindles are usually made with a uniform friction but may be made, however, with independent and adjustable friction for varying tension, if desired. A stop-motion is furnished at option of purchaser.

Whitin Reels, Continued.



Reel Stop Motion Diagram.

Whitin Reels, Continued.

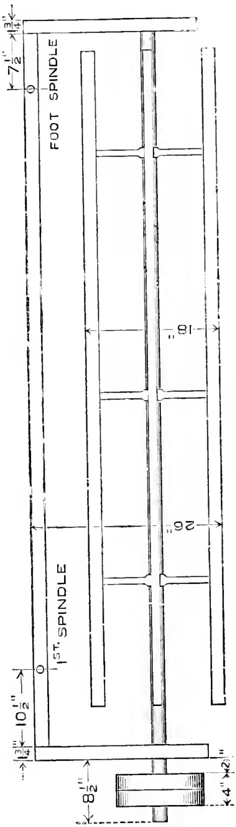
Floor Space.

No. of Spindles	2¾ in. Space.		3 in. Space.		3¼ in. Space.		3½ in. Space.		3¾ in. Space.		4 in. Space.		No. of Spindles
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	
30									11	6¾	12	2	30
32							11	6½	12	2¼	12	10	32
34					11	5¼	12	1½	12	9¾	13	6	34
36			11	3	11	11¾	12	8½	13	5¼	14	2	36
38			11	9	12	6¼	13	3½	14	0¾	14	10	38
40	11	5¼	12	3	13	0¾	13	10½	14	8¼	15	6	40
42	11	10¾	12	9	13	7¼	14	5½	15	3¾	16	2	42
44	12	4¼	13	3	14	1¾	15	0½	15	11¼			44
46	12	9¾	13	9	14	8¼	15	7½					46
48	13	3¼	14	3	15	2¾	16	2½					48
50	13	8¾	14	9	15	9¼							50
52	14	2¼	15	3	16	3¾							52
54	14	7¾	15	9									54
56	15	1¼	16	3									56
58	15	6¾											58
60	16	0¼											60

Driving Pulleys:—12″ diameter by 2″ face. Speed from 125 to 150 revolutions per minute.

Floor Space:—28″ wide and lengths as per above table.

Whitin Reels, Continued.



Floor Plan.

Whitin Reels, Continued.

Lea Stop Motion.

Plain Traverse.

Yds.	A	B	D	F	G	H	54'' Reel.		60'' Reel.		72'' Reel.	
							C	E	C	E	C	E
120	38	63	20	42	16	21	21	133	20	114	20	95
240	38	63	20	21	16	42	21	133	20	114	20	95
360	38	63	20	21	24	42	21	133	20	114	20	95
480	38	63	20	21	32	42	21	133	20	114	20	95
600	38	63	20	21	40	42	21	133	20	114	20	95
720	38	63	20	21	48	42	21	133	20	114	20	95
840	38	63	20	21	56	42	21	133	20	114	20	95

Gears F and H are interchangeable.
This motion cannot be used on Cross Traverse.

Lea Stop Motion.

Cross Traverse.

Yds.	A	B	F	G	H	54'' Reel.			60'' Reel.			72'' Reel.		
						C	D	E	C	D	E	C	D	E
120	42	91	42	16	21	26	20	126	26	21	108	39	21	135
240	42	91	21	16	42	26	20	126	26	21	108	39	21	135
360	42	91	21	24	42	26	20	126	26	21	108	29	21	135
480	42	91	21	32	42	26	20	126	26	21	108	39	21	135
600	42	91	21	40	42	26	20	126	26	21	108	39	21	135
720	42	91	21	48	42	26	20	126	26	21	108	39	21	135
840	42	91	21	56	42	26	20	126	26	21	108	39	21	135

Gears F and H are interchangeable.
This motion cannot be used on Plain Traverse.

Whitin Reels, Continued.

Reel Production Tables.

No. Yarn.	54 IN. REEL. Revolutions per Minute. 125	130	135	140	145	150	60 IN. REEL. Revolutions per Minute. 120	125	130	135	140	145	No. Yarn.
1	50.22	52.24	54.24	56.25	58.26	60.27	53.57	55.81	58.04	60.27	62.50	64.74	1
2	25.11	26.12	27.12	28.12	29.13	30.14	26.79	27.91	29.02	30.14	31.25	32.37	2
3	16.74	17.41	18.08	18.75	19.42	20.09	17.86	18.60	19.35	20.09	20.84	21.58	3
4	12.55	13.06	13.56	14.07	14.57	15.07	13.40	13.95	14.51	15.07	15.62	16.18	4
5	10.04	10.45	10.85	11.25	11.65	12.06	10.72	11.16	11.61	12.06	12.50	12.95	5
6	8.37	8.71	9.03	9.38	9.71	10.05	8.93	9.30	9.67	10.05	10.42	10.79	6
7	7.17	7.46	7.75	8.04	8.33	8.61	7.66	7.97	8.29	8.61	8.93	9.25	7
8	6.28	6.53	6.78	7.04	7.28	7.54	6.70	6.98	7.26	7.54	7.82	8.09	8
9	5.58	5.81	6.03	6.25	6.48	6.70	5.95	6.20	6.45	6.70	6.95	7.20	9
10	5.02	5.23	5.43	5.63	5.83	6.03	5.36	5.58	5.81	6.03	6.25	6.48	10
11	4.56	4.75	4.93	5.12	5.30	5.48	4.87	5.08	5.28	5.48	5.64	5.89	11
12	4.18	4.36	4.52	4.69	4.86	5.02	4.46	4.65	4.84	5.02	5.21	5.40	12
13	3.86	4.02	4.17	4.33	4.48	4.64	4.12	4.29	4.47	4 64	4.81	4.98	13
14	3.58	3.73	3.88	4.02	4.16	4.30	3.83	3.99	4.15	4.31	4.47	4.63	14
15	3.34	3.48	3.62	3.75	3.89	4.02	3.57	3.72	3.87	4.02	4.17	4.32	15
16	3.14	3.27	3.39	3.52	3.64	3.77	3.35	3.49	3.63	3.77	3.91	4.05	16
17	2.95	3.08	3.20	3.31	3.43	3.55	3.15	3.29	3.42	3.55	3.68	3.81	17
18	2.79	2.90	3.02	3.13	3.24	3.35	2.98	3.10	3.23	3.35	3.47	3.59	18
19	2.65	2.75	2.85	2.96	3.07	3.17	2.82	2.99	3.06	3.17	3.29	3.41	19
20	2.51	2.61	2.70	2.82	2.92	3.02	2.68	2.79	2.90	3.02	3.13	3.24	20
21	2.40	2.49	2.58	2.68	2.78	2.87	2.55	2.66	2.77	2.87	2.98	3.08	21
22	2.28	2.38	2.47	2.56	2.65	2.74	2.44	2.54	2.64	2.74	2.84	2.95	22
23	2.19	2.27	2.36	2.45	2.54	2.62	2.33	2.43	2.53	2.62	2.72	2.82	23
24	2.10	2.18	2.26	2.35	2.43	2.51	2.24	2.33	2.42	2.51	2.61	2.69	24
25	2.01	2.09	2.17	2.25	2.33	2.41	2.15	2.23	2.32	2.41	2.50	2.59	25
26	1.93	2.01	2.09	2.17	2.24	2.32	2.06	2.15	2.23	2.32	2.41	2.49	26
27	1.86	1.94	2.01	2.09	2.16	2.23	1.99	2.07	2.15	2.23	2.32	2.40	27
28	1.80	1.87	1.94	2.01	2.08	2.15	1.92	2.00	2.08	2.15	2.23	2.31	28
29	1.73	1.80	1.87	1.94	2.01	2.08	1.85	1.93	2.00	2.08	2.16	2.23	29
30	1.68	1.74	1.81	1.88	1.94	2.01	1.79	1.86	1.94	2.01	2.09	2.16	30

NOTE:—Result in pounds per spindle per day. Allowance is made in above table for doffing, etc.

Whitin Reels, Concluded.

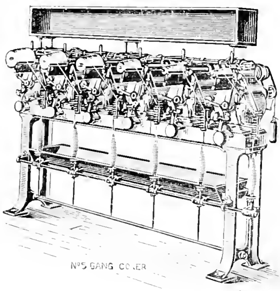
Reel Production Tables. Continued.

No. Yarn.	72 IN. REEL. Revolutions per Minute. 110	115	120	125	130	135	90 IN. REEL. Revolutions per Minute. 100	105	110	115	120	125	No. Yarn.
1	58.93	61.61	64.29	66.97	69.65	72.33	66.97	70.31	73.66	77.01	80.36	83.71	1
2	29.47	30.81	32.15	33.49	34.83	36.16	33.49	35.16	36.83	38.51	40.18	41.86	2
3	19.65	20.54	21.43	22.33	23.22	24.11	22.32	23.44	24.56	25.67	26.78	27.90	3
4	14.74	15.40	16.07	16.74	17.41	18.08	16.74	17.58	18.42	19.26	20.09	20.93	4
5	11.79	12.32	12.86	13.40	13.93	14.47	13.40	14.06	14.73	15.40	16.07	16.74	5
6	9.82	10.27	10.72	11.16	11.61	12.05	11.16	11.72	12.33	12.84	13.40	13.95	6
7	8.42	8.73	9.19	9.57	9.95	10.33	9.57	10.05	10.53	11.00	11.48	11.96	7
8	7.37	7.70	8.04	8.37	8.71	9.04	8.37	8.79	9.21	9.63	10.05	10.47	8
9	6.55	6.85	7.15	7.44	7.74	8.04	7.44	7.81	8.19	8.56	8.93	9.30	9
10	5.90	6.16	6.43	6.70	6.97	7.23	6.70	7.03	7.37	7.70	8.04	8.37	10
11	5.36	5.60	5.85	6.09	6.33	6.58	6.09	6.39	6.70	7.00	7.31	7.61	11
12	4.91	5.14	5.36	5.58	5.81	6.03	5.58	5.86	6.14	6.42	6.70	6.98	12
13	4.54	4.74	4.95	5.15	5.36	5.57	5.15	5.41	5.66	5.93	6.18	6.44	13
14	4.21	4.40	4.59	4.79	4.97	5.17	4.79	5.03	5.26	5.50	5.74	5.98	14
15	3.93	4.11	4.29	4.47	4.64	4.82	4.47	4.69	4.91	5.14	5.36	5.58	15
16	3.69	3.85	4.02	4.19	4.36	4.52	4.19	4.40	4.61	4.82	5.02	5.23	16
17	3.47	3.63	3.78	3.94	4.20	4.26	3.94	4.14	4.34	4.53	4.73	4.93	17
18	3.28	3.43	3.57	3.72	3.87	4.02	3.72	3.91	4.09	4.28	4.47	4.65	18
19	3.10	3.24	3.39	3.53	3.67	3.81	3.53	3.70	3.88	4.05	4.23	4.41	19
20	2.95	3.08	3.22	3.35	3.49	3.62	3.35	3.52	3.69	3.85	4.02	4.19	20
21	2.81	2.94	3.06	3.19	3.32	3.45	3.19	3.35	3.51	3.67	3.83	3.99	21
22	2.68	2.80	2.92	3.05	3.17	3.29	3.05	3.20	3.35	3.50	3.66	3.81	22
23	2.56	2.68	2.80	2.91	3.03	3.15	2.91	3.06	3.21	3.35	3.50	3.64	23
24	2.46	2.57	2.68	2.79	2.90	3.02	2.79	2.93	3.07	3.21	3.35	3.49	24
25	2.36	2.47	2.57	2.68	2.79	2.90	2.68	2.81	2.95	3.08	3.22	3.35	25
26	2.27	2.37	2.47	2.58	2.68	2.78	2.58	2.71	2.84	2.96	3.09	3.22	26
27	2.19	2.28	2.38	2.48	2.58	2.68	2.48	2.61	2.73	2.85	2.98	3.10	27
28	2.11	2.20	2.30	2.39	2.49	2.58	2.39	2.51	2.63	2.75	2.87	2.99	28
29	2.63	2.13	2.22	2.31	2.40	2.50	2.31	2.43	2.54	2.66	2.77	2.89	29
30	1.97	2.06	2.15	2.23	2.32	2.41	2.23	2.35	2.46	2.57	2.68	2.79	30

NOTE:—Result in pounds per spindle per day. Allowance is made in above table for doffing, etc.

UNIVERSAL WINDERS.

(To wind either cones or parallel tubes.)



This is a Spindle Winder, and the machines are built in gangs of six spindles each.

Heretofore cotton yarn intended for use in the knit goods industry has been wound in conical form for shipment by a process termed drum winding, so called by reason of the yarn being drawn on to the surface of the paper cone through frictional contact with the face of a revolving, conical drum.

A careful investigation of the knit goods industry discloses the fact that it has been the custom of the knitters to rewind a large part of the yarn received by them on cones.

In shipping yarn on mule cops there is a large amount of waste, owing to the tender condition of the cops, which in transportation are subjected to such crushing and straining as to displace the yarn and prevent its running off evenly and uniformly. Notwithstanding this, there is an enormous amount of yarn shipped to the knitting mills on mule cops, to be wound on bobbins, the knitters preferring to lose a large amount of waste rather than to have the yarn rewound the second time after the arbitrary and radical treatment which the yarn has heretofore received in the process of winding.

Universal Winders, Continued.

The following points are claimed for the Universal system of winding:

1. The yarn is laid from start to finish in a regular succession of coils and layers, the same number of coils in each layer.

2. The coils of yarn being laid side by side in close contact, form a smooth, hard basis on which the successive coils are laid evenly, without crushing or displacing the twist.

3. Every coil is reversed at each end of the cone, passing back at a uniform angle, and placed in position, crossing every other previously-laid coil, and binding it into place. The guide delivering the yarn close to the surface of the cone prevents any coils from passing beyond the point of reversal, and slipping across the end of cone to produce "cobwebs."

4. In winding by the Universal process, the spindle is rotated at uniform speed and the yarn guide resting lightly against the surface of the yarn, lays it in uniform coils, thus preventing any slipping of the coils, and protecting the yarn against abrasion and straining.

5. The number of coils in each layer about the cone being absolutely uniform, the same thickness of yarn is built up at each end, resulting in a perfectly formed cone of uniform taper from start to finish.

6. The cone of yarn being built upon a uniform taper from start to finish, the delivery of yarn to the knitting machine is absolutely uniform from start to finish.

Universal Winders, Continued.

7. The tension on the yarn in winding is applied by passing the yarn between a number of polished steel blades, the pressure of which is graduated to produce uniform stress upon the yarn.

8. The tension blades throw off from the yarn dirt, specks, and slubs, thereby improving the quality of the yarn.

9. The spindle is driven positively at high speed, and the centrifugal force throws from the surface of the cone any dust, dirt, or lint which might have the tendency to accumulate there.

10. The spindle being positively driven and the guide controlled in positive relation to the surface of the cone, compels the absolutely uniform winding, and is adjustable to produce cones of exact dimensions.

11. Owing to the compactness of winding and the uniformity of tension there is a gain of from one-third to one-half in the packing space of the cones, which being of uniform dimensions pack closer and with greater safety for shipment.

12. The yarn being wound in perfectly cylindrical form under uniform tension, with the same number of coils in each layer, with no yarns overrunning the ends of the cone, and built into cones having a uniform taper from start to finish, delivers to knitting machines under the most favorable conditions, insuring uniformity in the fabric, and no loss or waste from start to finish.

Universal Winders, Continued.

Many types of Universal Winders are manufactured to suit the demands of different trades.

The No. 5 Machine answers all the purposes of the average cotton mill, whether in winding the tenderest soft yarn on cones for the knitters, or hard twisted warp yarn on tubes.

The only other machine that might interest a cotton manufacturer is possibly the No. 7 Machine, for the use of manufacturers of large cords and twines. The maximum capacity is a cone or tube 16″ x 16″. It is made with only one spindle to each machine, which occupies a floor space of 4′-3″ x 5′-0″. Its production on large cords is from 1,000 to 1,500 pounds per day.

Machine No. 5.

This is the machine ordinarily used by the cotton mill trade. It is adapted to winding twine, cord, thread, or yarn, in packages of from 4″ x 4″ to 6″ x 6″: and also in conical form with 6″ traverse. It is built in gangs of six spindles each to the frame, which occupies a floor space of 7′-5″ x 2′-0″.

The spindle speed is from 1000 to 1800 turns per minute.

Length of traverse, 6″, 5½″, 5″, 4½″, and 4″.

The gangs are usually grouped three in a line, making a total of 18 spindles, which supplies a proper number for an average operator to handle on single 20s yarn.

The machines are driven from shafting 1 11/16″ diameter, provided with tight and loose single flange pulleys, 10″ in diameter and with 1⅝″ face; belting 1⅜″ wide should be used. It is advised that these pulleys be bought with the machines to insure the most satisfactory results.

As this is the standard type of this machine ordinarily used in cotton mills, it is the only one for which we show cuts of floor plans, etc.

These cuts, it will be noticed, illustrate the machine both driven from above and driven from below; and also two methods of driving, with quarter turn belt and with open and crossed belt, depending upon whether the winders are placed lengthwise with the mill or across it.

Universal Winders, Continued.

3-Way Tension Attachment.—This device is designed for winding three ends of yarn on one package at the same time. It may be attached to any of the No. 5 Machines. It is principally used for winding braider cops, but may be applied to other lines, such as twister work.

When used for Braider Cops, the production of the braider is greatly increased, for with two to three times as much yarn in the same space, there are fewer cops for doffing. The three ends are wound under exactly the same conditions and laid perfectly parallel to each other, insuring a perfect delivery to the braider or twister.

This system of winding on cheap paper tubes does away with the expensive wooden braider bobbins. An improved braider carrier is made especially for this style of cop, which, by its construction, will allow of an increase of speed of 20% to 40%.

No. 13 Multiple Machine.—This is simply a modification of the No. 5 Machine, so arranged that each spindle draws from six ends or less: the construction of the machine insures the yarn's being wound in a perfectly flat band from start to finish.

Universal Winders, Continued.

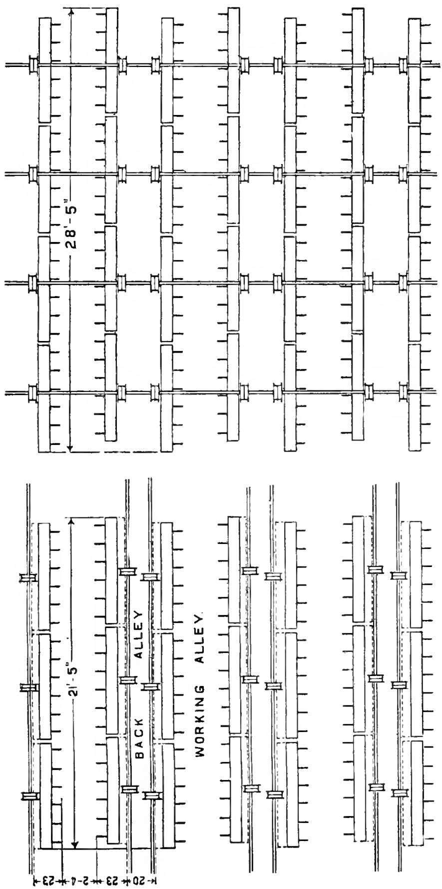
Production Table.

(in lbs. per day of 10 hours.)

Number of Yarns.	Pounds per Spindle.	Number of Yarns.	Pounds per Spindle.
6	30.0	31	6.4
7	25.7	32	6.2
8	22.5	33	6.0
9	20.0	34	5.8
10	19.0	35	5.7
11	18.1	36	5.5
12	16.6	37	5.4
13	15.3	38	5.2
14	14.2	39	5.1
15	13.3	40	5.0
16	12.5	41	4.8
17	11.7	42	4.7
18	11.1	43	4.6
19	10.5	44	4.5
20	10.0	45	4.4
21	9.5	46	4.3
22	9.0	47	4.2
23	8.7	48	4.1
24	8.3	49	4.0
25	8.0	50	3.9
26	7.7	60	3.3
27	7.4	70	2.8
28	7.1	80	2.5
29	6.9	90	2.2
30	6.6	100	2.0

The above table is for single yarns ; for 2-ply yarns, the production will be about twice that given in the tables, less 12½% additional for stoppages ; for 3-ply yarns, multiply the production by three, and allow 20% additional for stoppages, etc.

Universal Winders, Continued.

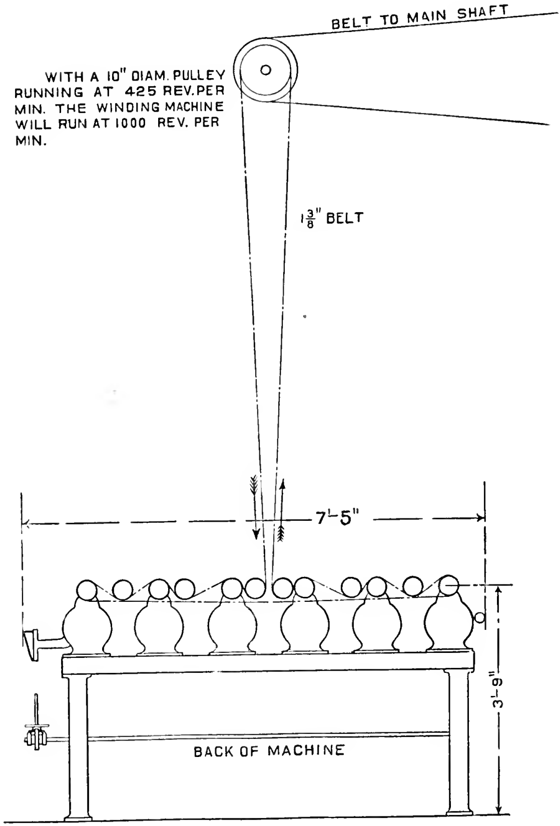


DRIVEN WITH OPEN AND CROSSED BELTS.

DRIVEN WITH QUARTER TURN BELT

NO. 5 UNIVERSAL WINDING MACHINE.

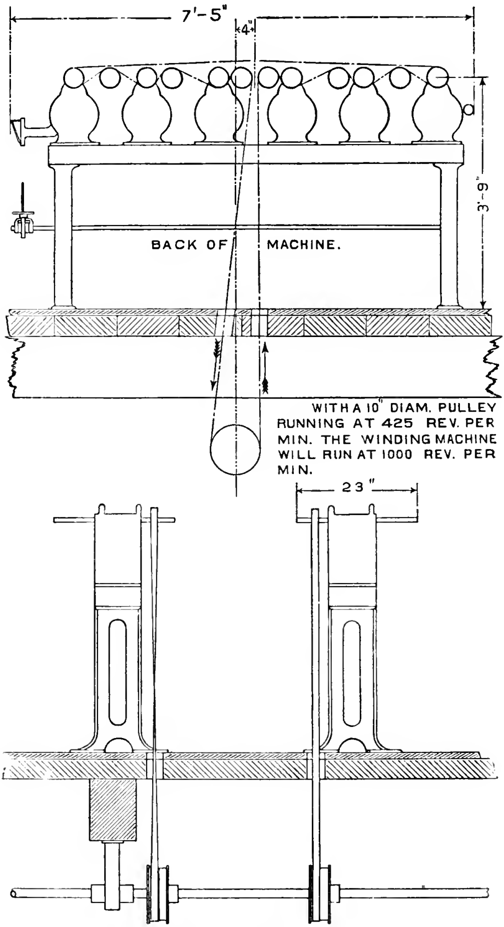
Universal Winders, Continued.



DRIVEN FROM ABOVE.

NO. 5 UNIVERSAL WINDING MACHINE.

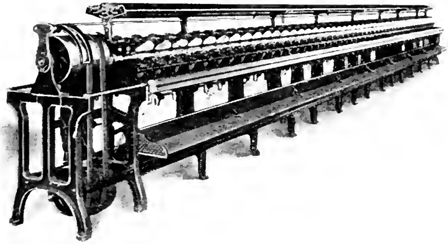
Universal Winders, Concluded.



DRIVEN FROM BELOW.
NO. 5 UNIVERSAL WINDING MACHINE.

FOSTER WINDERS.

(To wind either cones or parallel tubes.)



Their New "1900" Machine is the latest improved Drum Winder on the market, as well as the fastest running. It gives the greatest production per operator and best shaped cones. Its greatest advantage over the older types of Drum Winders is that no oil or dirt can possibly get on the yarn, yet the cylinders can be easily and thoroughly lubricated; the tension and speed are more even, and less power is required to drive it.

The construction of the machine is such that the cylinders are covered and it is impossible for any oil or dirt to come in contact with the roll on which the yarn rests while being wound.

These shell rolls are made of hard wood and will need no covering, thus saving a large expense over the old style, which were covered with leather.

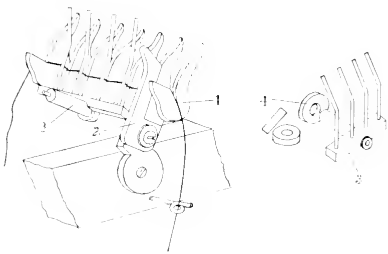
The rolls are strung on a shaft connected with the driving end of the machine and independent of the drums, so all that is required of the roll is to drive the cone, and the yarn has no contact with the cylinder.

By this new device we not only get more production with the same revolution of the cylinder as before, but a more compact body of yarn, thus enabling more yarn to be shipped in the same space.

The Stop Motion acts automatically when a thread breaks or runs out: the yarn body is raised from the roll just enough to clear it. The end can be easily found by the operator.

Machines made in lengths of 20, 40, 60, 80, and 100 Spindles.

Foster Winders, Continued.



Metallic Tension and Slug Catcher.

The above cuts illustrate a more satisfactory arrangement than a cloth tension. No. 2 is a yarn scraper and slug catcher. No. 3 is an automatic adjustable piece which gives an even tension regardless of variable speeds of the thread when winding. The speed of the thread determines the amount of frictional surface overcome; when thread runs faster, less surface is offered, and when thread runs slower, more surface is offered. Any desired tension can be made by adding or removing machine weights No. 4. A much finer adjustment can be made by tipping casting No. 1, thereby getting more or less direct pressure from weights.

Gear Table.

Showing Proper Size Gear for Different Speeds per Minute.

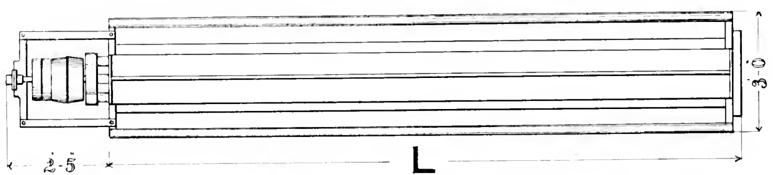
Number of Teeth in Gear.	Theoretical Production in feet per Minute.	Actual feet per Minute, with 25% allowance for stoppages.
22	685	514
24	610	458
26	543	408
28	482	365

Foster Winders, Continued.

Table of Dimensions.

Number of Spindles per Frame.	Length.		Width of Frames.	Driving Pulleys.			Belts.
	Feet.	Inches.		Diameter.	Width.	Speed.	
100	41	0	36 inches for all frames.	12 inches for all frames.	2½ inches for all frames.	500 Revolutions per minute for all frames.	2-inch belts on all frames.
80	33	2					
60	25	9					
40	18	2					
20	10	8					

Lengths given above = L + 2′-5″.



Floor Plan Foster Winder.

Foster Winders, Concluded.

Production Table.

(in lbs. per day of 10 hours.)

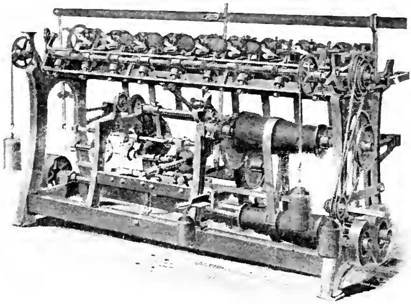
Number of Yarn.	Pounds per Spindle.	Number of Yarn.	Pounds per Spindle.
6	20.3	31	3.9
7	17.4	32	3.8
8	15.2	33	3.7
9	13.6	34	3.5
10	12.2	35	3.4
11	11.0	36	3.3
12	10.1	37	3.2
13	9.4	38	3.1
14	8.7	39	3.1
15	8.1	40	3.0
16	7.6	41	2.9
17	7.1	42	2.8
18	6.7	43	2.8
19	6.3	44	2.7
20	6.0	45	2.6
21	5.7	46	2.6
22	5.4	47	2.5
23	5.2	48	2.5
24	5.0	49	2.4
25	4.9	50	2.4
26	4.7	60	1.9
27	4.5	70	1.6
28	4.3	80	1.4
29	4.2	90	1.2
30	4.0	100	1.1

Calculated on a basis of 685 feet per minute, with 25% allowance for stoppages, etc.

The above table is for one end; if it is desired to double and wind two ends at one time, the production will be about twice that given in the tables, less 15% for stoppages; for three ends, multiply the production by three, and allow 25% for stoppages, etc.

While 685′ per minute is the standard speed (or 514′ per minute net, allowing 25% for stoppages, etc.), still for very tender yarn and under special conditions it is desirable to run at slower speeds. The gear table on page 201 will show the speeds that correspond to the different size gears.

FRANKLIN BALL WINDERS.



These machines are seldom used, but the following information will be found convenient :

These winders are for balling thread, twine, knitting cotton, etc. They are built with geared flyers unless otherwise ordered, and are of three standard sizes : 9, 12 and 16 spindles each in length, and of 5″, 6″, 7″ and 8″ gauges.

The standard ball winder is 7″ gauge ; the size of the ball is regulated by the gauge, being about 2½″ less in diameter than the width of the gauge. Balls, however, may be made as small as desired on any gauge, as the diameter and shape of the ball are determined entirely by the cam, different balls demanding different cams.

The **pulleys** are tight and loose, and the speed recommended in starting up a machine is 200 revolutions per minute : by experimenting, however, this speed can be increased very considerably, depending upon the conditions. Upon different classes of work, these machines vary from 160 to 450 revolutions per minute.

As to **production** it is out of the question to do any more than give the roughest approximation, as it depends upon the size of the ball, the character of the yarn, the speed and the attendance.

In general,—The normal production under ordinary conditions is, say 60 lbs. per spindle in 10 hours on No. 1 yarn, or about 30 lbs. on No. 2 yarn. From this it can be figured for any number of yarn. This production may be increased by winding from large spools, increased tension, forced speed, etc.

Franklin Winders, Concluded.

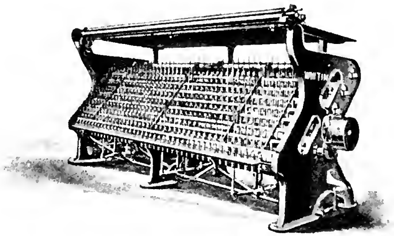
The following table gives the data relating to each size of frame and gauges :

Number of Spindles.	Width of Frames.	Length of Frames.				Pulleys.		
		Gauge.				Diameter.	Width Face.	Revs. per Minute.
		5″	6″	7″	8″			
9	3′-3″	5′-5¼″	6′-2¼″	6′-11½″	7′-8¼″	8″	2″	200
12	3′-3″	9′-8¼″	7′-8¼″	8′-8½″	9′-8¼″	10″	2″	200
16	3′-3″	8′-4¼″	9′-8¼″	11′-½″	12′-4¼″	10″	2″	200

Long Chain Quilling Machine,

Manufactured by

The Whitin Machine Works.



In preparing yarn for colored goods, the advantages gained by the chain system of dyeing, over the skein, are so many, both in the line of economy as well as in the better quality of the yarn produced, it is evident that some good method whereby the yarn which has already been dyed or bleached in the chain could be directly put on to quills or bobbins ready for weaving, must present itself favorably to the attention of all manufacturers of colored goods.

To accomplish this, the machine shown in the accompanying cut has been constructed. The chain of yarn, that comes to the machine from the dry cans or dry room, is placed on a turn table and passed over friction drums, same as in ordinary chain beaming, the whole operation being similar to beaming.

The machine is very simple, and easily operated by girls. Any ordinary size quill or bobbin can be used ; those generally used contain 1800 yards of No. 28 yarn and 2000 yards of No. 33 yarn.

Whitin Quillers, Continued.

The building motion on the machine has a quick return which securely binds the yarn on to the quill, thereby forming a very solid and compact bobbin. "Lapped ends" cannot be made, consequently bobbins will weave from start to finish without break of yarn, and also without leaving any waste on bobbin.

The yarn does not come in contact with any friction, thus burnishing and burning or changing of color is prevented, which is a cause of so much complaint on the old method of quilling, colors being left bright and clear as originally dyed.

Capacity of the machine is about the same as ordinary chain beaming.

Shipper motion is operated by the foot of the operator, leaving both hands free. Machine is also provided with a "slow motion." Each machine has 378 spindles. Method of doffing same as on mules, yarn being depressed below bottom of quill or bobbin and then wound on bare spindle. Time consumed doffing and starting new set of bobbins, eight to ten minutes. Two machines can be placed in one eight foot bay of a mill. Pulleys are 10″ dia., using a 2″ belt. Speed, 320 revolutions per minute

Floor Space:—Length outside of driving pulleys, 10′-10″ x 4′ width.

We claim the following as being among the many advantages gained by the use of this machine:

First.—The putting of the yarn on to quills or bobbins direct from chain, or, in other words, from chain to quill or bobbin ready for weaving without any intermediate process.

Second.—The greatly increased amount of yarn put on to quill or bobbin, the avoidance of lapped ends, and the increased product per loom gained thereby: the avoidance of burnt and burnished yarn, whereby the strength as well as the original brightness and clearness of the yarn is fully maintained.

Whitin Quillers, Continued.

Third.—Goods look brighter and better. Second quality is largely reduced because of absence of mixed shades of color.

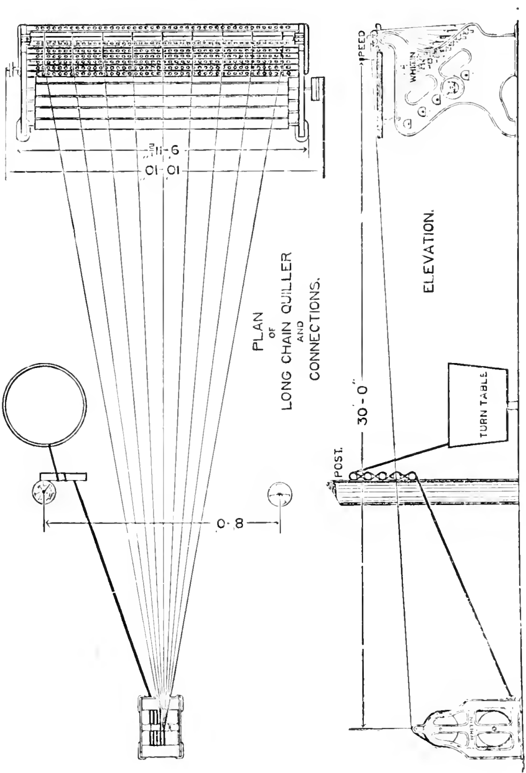
Fourth.—A great saving in waste is effected, and a very material reduction in cost is made.

The following table is composed of actual results reported to us from mills using our machines. It must be borne in mind, however, that the production varies according to the efficiency of the help, and the nature of the yarn, whether printed or dyed, hard or soft twisted, and length of chain. We recommend using chains 9,000 yards long. It is believed, under favorable conditions, most of these figures can be excelled.

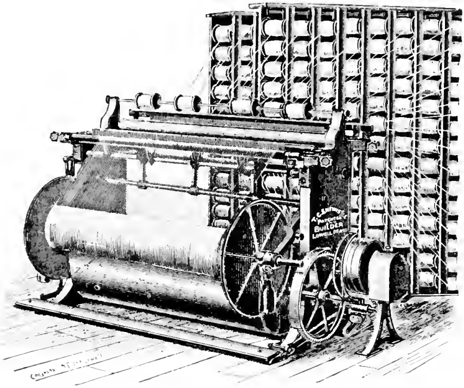
TABLE OF PRODUCTION.

No. Spindles.	No. of Yarn.	No. Lbs. Quilling per Day of 10 Hours
378	12½	316
378	14½	172
378	18	150 to 200
378	25	133 to 151
378	26	125 to 150
378	28	125
378	29	98
378	33½	114
378	50	58

Whitin Quillers, Concluded.



ENTWISTLE WARPING MACHINERY.



Slasher Warper.

These well known machines require but little explanation, but attention is called to the following points :

Cylinders.—These are made of cast iron 18″ or 20″ diameter, and 54″ long. If it is desired to remove the steel shaft for any purpose it can be done.

Stop Motion.—This is very sensitive. It stops the machine instantly on the breaking of a thread. Besides the stop motion there is a slack thread wire which prevents the drop wires from falling down and stopping the machine when the threads are not broken ; also a drop roll that takes care of the slack of the spools in the action of the warper stopping. The stop motion is connected with measuring clock which stops the warper at the desired length of warp.

Slow Motion.—The object of a slow motion is to start the machine easily and to bring the threads to an even tension before arriving at full speed, thus avoiding breaking of thread or yarn.

All gears in this slow motion are cut gears, which makes the running of the motion easy and noiseless. It is impossible for the slow motion bracket to get out of line as it is a one piece bracket, thus avoiding all tight bearings. We claim it is the best ever applied to a warper.

Drop Wires.—These are placed on slotted shaft over which is fitted a shield to hold them in place and also to prevent the hinge of drop wire from filling with lint. If it is desired to reduce the number of wires this can be done by

Entwistle Warpers, Continued.

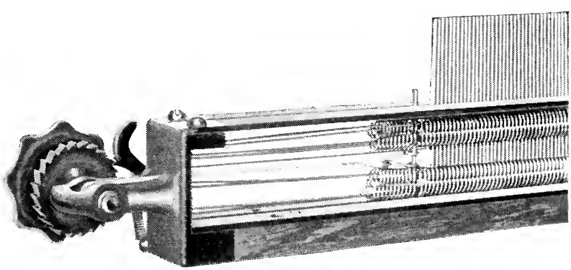
slipping wires along the aforesaid slotted shaft. We arrange these wires for 750 threads or less on two or three rows. The drop wire holder is in sections which allows the wires to set more evenly than single wires do.

Lifter Motion.—The function of this motion is to raise the drop wires up in line with the others after an end breaks and the machine is stopped, so the operator can easily rethread them.

Creel.—The creel used in connection with these Warpers is V-shaped: wood work made of white wood, stained cherry and fitted with iron, porcelain, or glass steps. For ordinary use the iron steps are recommended but for fine work the porcelain or glass steps are recommended.

Warper Beams—These are furnished in all the standard sizes. Heads from 20 to 27 inches in diameter, made of cast iron, turned and faced on the inside, with groove in top for friction rope. The barrels are made of wood; they are nine inches in diameter and 54 inches long between heads. The shafts in these beams are made of machinery steel 1½ inches in diameter.

Expansion Comb.—The old style of comb made by Entwistle



and other people, as illustrated above, was simply two strips of white wood moulding stained cherry. The dents are inserted in a spring which is fastened between the two pieces of moulding by screws; a right hand and a left hand screw regulating the expansion of the comb.

Improved Expansion Comb—The expansion comb or reed for warpers was invented nearly sixty years ago, and since that time many improvements have been made in it to increase the convenience in handling and the uniformity with which the threads are spread across the beams. The success of the

Entwistle Warpers, Continued.

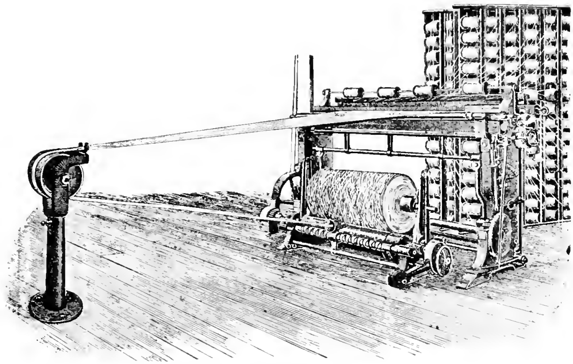
fabric depends in a great measure upon the uniformity of the warping, and a reed expanded irregularly is sure to cause trouble by subjecting part of the warp to increased tension, thereby making bad work in weaving and consequent imperfections in the finished goods. One of the chief causes of this irregularity is the dust or fly working its way into the comb boxes and clogging the wires so as to prevent their moving easily when expanding or contracting. As it is obviously impossible to construct a reed box so tight that flyings can not get inside, the new improved reed or expanding comb shown on bottom of the preceding page, is built in an open iron frame work, leaving the springs and working parts exposed so that they may be readily cleaned. As the threads coming from the creel pass over the iron frame work of the reed, there is no necessity for either brass or glass rods such as are used to protect the wood work of the ordinary reed.

Several improvements have been made in the method of adjusting the reed when operated by a tape. Formerly the operator loosened the set screw with one hand, and then with the other hand wound up the end of the tape by means of a wheel; if during this operation he happened to lose his hold of the hand wheel, the spring would jerk the reed in, breaking the ends which are held by the stop motion. This difficulty has now been entirely obviated and the adjustment made easier by the rachet wheel also shown in cut.

A change has also been made in connection of the tape with the reed; on the new reed the tape runs straight from where it is attached to the spring to the roller on which it is wound, instead of having the quarter turn in it, as heretofore. Another improvement is the adjustment of the guide wire where it is raised from its usual position at the bottom of the reed wires and placed between the two springs; it thus serves to keep the spring apart and at the same time to stiffen the reed.

Leese Warpers.

The purpose of this machine is to take spooled yarn and put it on what is termed a "ball," which is a very convenient form for dyeing. It can be arranged for 810 threads or



Leese Warpers.

(Long or Short Chain Warping Machines.)

less. These machines may be arranged in either one of three different ways:

(1). With the pedestal between the baller and the warper.

(2). With the baller between the pedestal and the warper.

(3). The pedestal is done away with, the yarn passing through an overhead guide and back to the baller.

Of course, the first, or tandem, arrangement requires more floor space; the second arrangement is the one usually adopted, and the one shown in diagram of floor space; the third arrangement is not quite so convenient as either one of the other two, but it occupies even less room than the second arrangement.

The balling machine is made in two widths, to make balls 30″ and 36″ long; any length desired less than 30″ can be arranged for by making the traverse of the trumpet screw the desired length.

Double or triple trumpet screws can be furnished with baller so that one, two or three balls can be made at the same time, if so desired.

Leeses can be taken whenever desired by raising a lever which separates the threads. One tooth is a yard on the cut gear, and four teeth is a cut on the leese gear. For instance, if you want fifty yard cuts, ten cuts in a leese, you use a fifty tooth cut gear and a forty tooth leese gear.

The gears on both the baller and the warper are covered with bonnets which are easily removed for cleaning purposes.

This warper can be arranged so as to make either beam or ball warps by simply removing the baller and putting in a cylinder.

Entwistle Warpers, Continued.

Spool and Beam Data for Warpers.

Yarn.	Spool. (With barrel 1½ inches in diameter.)			Beam. (54¼ inches between heads.) 9-inch barrel.	
Number of Yarn.	Traverse, in inches.	Diam. of head, in inches.	Weight of yarn on spool in pounds.	Diam. of head, in inches.	Weight of yarn on full beam in pounds.
8–16	6	5	1.9	26	420
18–26	6	4	1.2	24	350
28–38	5	4	1.0	22	285
40–50	4½	3½	.7	20	225

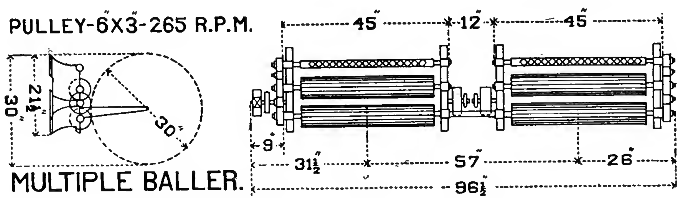


Diagram and Floor Plan.

Entwistle Warpers, Continued.

Production Table for Warpers.

(Given in pounds per day of 10 hours per 100 ends.)

33⅓% allowance for stoppages.

(50% should be allowed for colored work.)

Calculated for 18 inch cylinders.
36 Revolutions per minute of cylinder.
180 Revolutions per minute of pulleys.

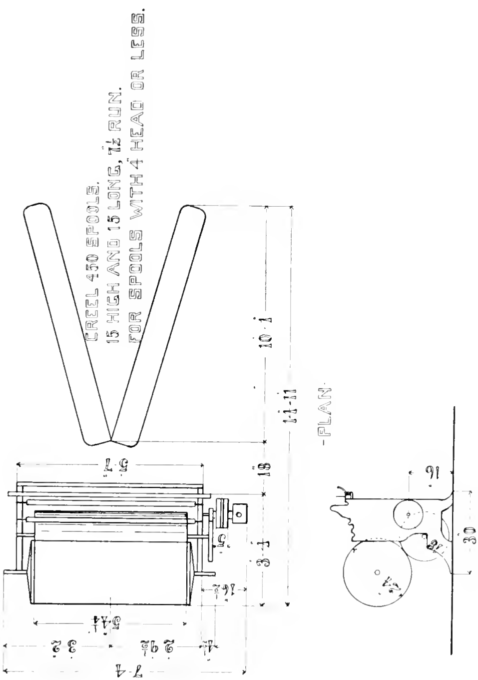
Number of Yarn.	Pounds Warped.	Number of Yarn.	Pounds Warped.	Number of Yarn.	Pounds Warped.
4	673	23	117	42	65
5	538	24	112	43	64
6	448	25	107	44	62
7	384	26	103	45	61
8	336	27	99	46	59
9	299	28	96	47	58
10	269	29	92	48	57
11	244	30	89	49	56
12	224	31	86	50	54
13	207	32	84	51	53
14	192	33	81	52	52
15	179	34	79	53	51
16	168	35	76	54	50
17	158	36	74	55	49
18	149	37	72	56	48
19	141	38	70	57	48
20	134	39	69	58	47
21	128	40	67	59	45
22	122	41	65	60	44

Rule:—Multiply the figures given in the tables by the number of ends in the creel and divide the result by 100.

Example:—Required the number of pounds of number 20 yarn warped per day of 10 hours, 400 ends in the creel.

$134 \times 400 \div 100 = 536$ lbs.

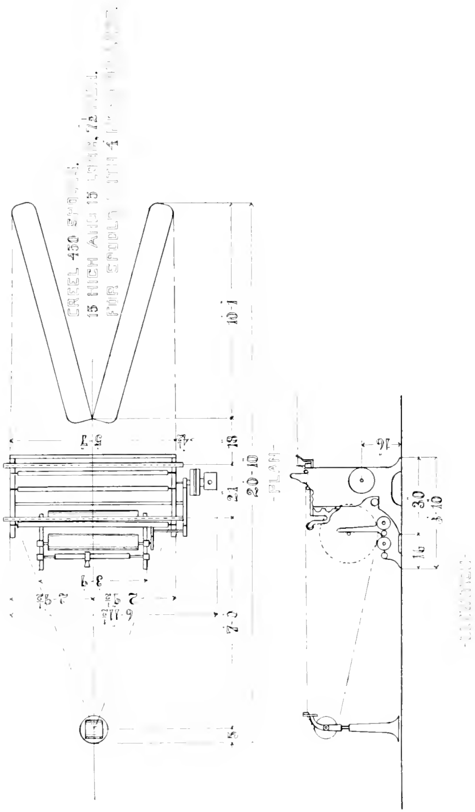
Entwistle Warpers, Continued.



Slasher Warper Diagrams

Pulleys.—11″ diameter by 2″ face, T. and L., 180 revolutions per minute. 11″ diameter by 1″ face, slow motion pulley.

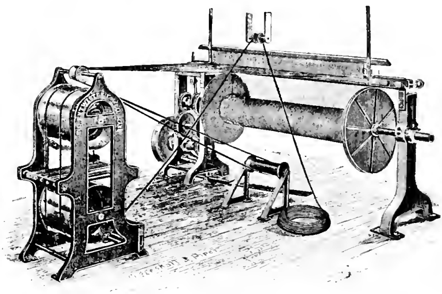
Entwistle Warpers, Concluded.



Leese Warper Diagrams.

Pulleys:—11″ diameter by 2″ face, T. and L., 180 revolutions per minute. 11″ diameter by 1″ face, slow motion pulley.

ENTWISTLE BEAMERS.



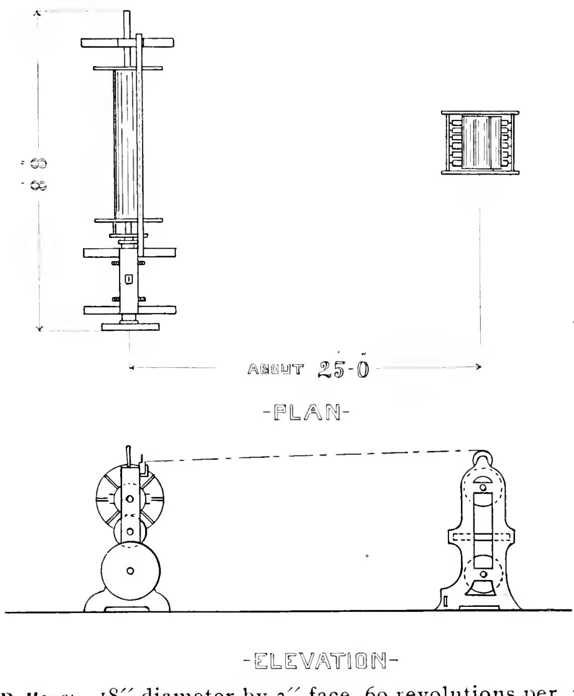
For Long or Short Chain Work. For Single or Double Chains.

The purpose for which this machine is used is to beam yarn from dyed chain warps on to warper beams before sizing the yarn. Two combs are used in this machine, one is an expansion comb, and the other is a swing comb. The Chain Warp enters on to the tension end of the beamer which holds the yarn taut as it goes to the swing comb. The swing comb frees the yarn of all snarls before it goes into the expansion comb which lays the yarn evenly on the beam, thus giving a perfect beam.

The machine has four changes of speed so as to reduce the speed of yarn as the beam fills.

The **production** of beamers depends very largely on how the yarn is handled in the dye house, not to mention the skill of the operator. Of course, there is no creeling to be done, the ends simply being laid in the comb or reed ; therefore, a beamer should do about 25% more than a slasher warper, under the same conditions.

Entwistle Beamers, Concluded.



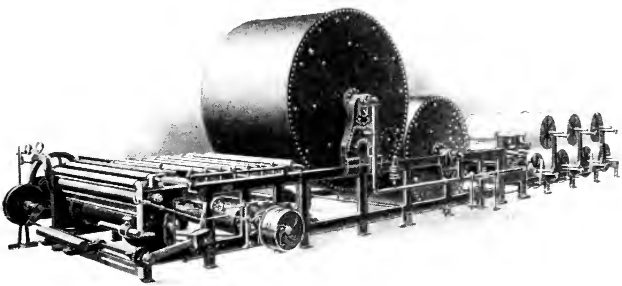
Pulleys:—18″ diameter by 3″ face, 60 revolutions per minute.

SLASHERS, TAPE DRESSING MACHINES, AND SIZING MACHINERY.

Built by

The Textile-Finishing Machinery Co.

Cylinder Slashers.



(The above cut illustrates the old way of building a slasher, with continuous frame.)

The absorption of The Thomas Phillips Company by The Textile-Finishing Machinery Company carried with it, of course, the well-known Phillips Slashers. After a careful study of the two or three other makes of slashers on the market, the new Company completely redesigned their machine so that it now embodies as far as possible the best features of the other machines together with its own improvements.

These machines are built with either one or two copper cylinders, made of Lake Superior Copper, weighing three pounds to the square foot (practically No. 16 Stubbs wire gauge). The cylinders stand clear of the floor, and are furnished with steam trap, steam pressure regulator, steam gauge, and steam safety valve. No solder is used in the construction of the cylinders, and they are warranted sound, tight, and safe under excessive pressure ; they are designed to work at fifteen pounds pressure, but are tested to thirty pounds. The copper is turned down on the cylinder so that the bolts that hold the ring and steel head go through the copper ; they are furnished with one-quarter inch steel plate heads thoroughly braced with stay rods and provided with

central shaft. The copper shell is braced to prevent collapse by 3″ x 3″ tee iron rings.

The "spiral scoop" is used to remove condensed water; this is the most efficient device known to the trade for handling the condensation from dry cylinders running at any speed however slow or fast. The importance of keeping the cylinder clear of water is apparent; for full information concerning this device, see description under head of "Dyeing and Special Finishing Machinery," in Vol. III. In the latest improved slasher the frame is built sectional instead of continuous: the four sections are,—the head section, cylinder section, size box section, and creel frame section. This arrangement admits of a machine's being set up without difficulty where floors are uneven; it also does away with the necessity for tearing down the entire frame to make repairs.

The **head section** is furnished with improved friction wind, nine inch diameter tension roll with two pressure rolls running on top of same; the tension roll is geared directly by a side shaft to nine-inch diameter size rolls in the size box. The head section is built either with improved slow motion and friction wind or with cones and friction wind or with positive drive. The measuring roll is made of heavy pattern of brass eighteen inches in circumference, or one-half yard. The cut indicator is connected directly to the measuring roll and extra gears are furnished so that cuts of any length can be indicated.

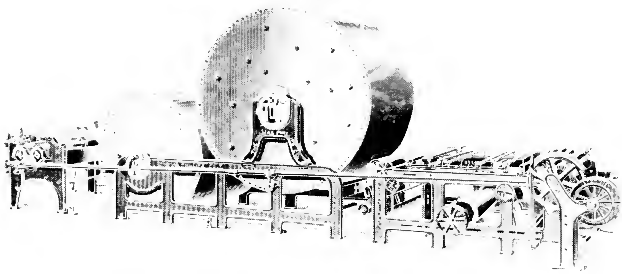
The **cylinder section** is provided with our improved anti-friction bearings for the cylinders, which bearings are furnished with the ordinary rolls or with the special construction for steel roll and ball bearings.

The **size box section** is furnished with size box made entirely of copper. This box is shaped rounding on bottom made strong and durable. An iron box of similar shape can be furnished if desired. The size box is provided with one or two nine-inch diameter copper size rolls running in bronze bushed bearings located on the outside of the box and driven direct from head of section. Also one five-inch brass immersion roll lifted by rack at either side.

Machines are furnished with two size boxes, each containing one single size roll for colored work, if desired. Improved seamless electro deposited copper size rolls are furnished on all machines. These rolls are seamless, the heads being covered with copper. They are a vast improvement over rolls of any other style, and are guaranteed to outlast by many years the old style of brazed sheet copper rolls.

The **creel section** is usually made horizontal and to accommodate as many beams as desired. When required, an upright creel section is furnished, which takes up less room. The machine is built to drive overhead or from

The Textile F. M. Co.'s Slashers, Continued.



(The above cut shows the head, cylinder and size box sections of the latest improved type of slashers built with sectional frames.)

pulley on either side. All wearing parts can be oiled without oil getting into size or on to yarn. Cut marker is put on between the size box and the cylinder to prevent its marking off on the warper beams. All rolls throughout the machine are made of seamless drawn brass tubing instead of the old-fashiond tin rolls formerly provided.

The Standard Cylinder Slasher is equipped with two copper cylinders, 5′ and 7′ diameter respectively by 5′ face, complete, with single headway, friction wind, slow motion, tension rollers, side shaft and pressure roll, steam trap, reducing and vacuum valves, steam gauge, single size box copper lined, two copper size rolls, and squeeze rolls, and one immersion roller, and creel for eight back beams.

Extras and Feasible Changes.—Any desired variations from this standard will be made; such as different sizes of cylinders, double size boxes, etc.

The size box section can be furnished with double jacketed size box, which enables the size to be heated and kept hot without introducing hot water into the size, thus weakening the consistency of same.

A double headway for dressing two beams at the same time, especially adapted for fine work and print cloth goods; machines so equipped will dress about fifty per cent. more goods than single machines. These headways can be applied to machines now in use, having only single headways.

The head section is furnished with an improved friction wind, sometimes called the Pacific Wind, which allows the beams to be wound of even tension. This is accomplished by levers and weights which give positive adjustment. The cylinders can be furnished with asbestos or magnesia covered heads, which prevent loss of heat from radiation.

The Textile F. M. Co.'s Slashers, Continued.

Also a **brush section** to brush the yarn between the size box and the drying cylinders. This is used more especially in the sizing of fine warps; the brush lays the fiber of the thread all one way, thereby greatly improving the weaving. The brush frame is furnished with one or two sets of brushes, as desired, each 12 inches in diameter and provided with small cleaner brushes driven direct from side shaft.

Roller bearings are furnished for the cylinders when required.

An extra **draw roll attachment** can be furnished on the cylinder section, which allows the yarn to come in contact with almost the entire surface of both cylinders, thus increasing the drying capacity full twenty per cent.

The **McCarthy friction drive** can be furnished for the cylinder section, which will enable the cylinders to be turned without tension of the yarn. This arrangement is connected direct from side shaft. It is provided with friction attachments to regulate perfectly the speed of the cylinder to accommodate the sets required to be dressed. In making up sets for weaving, experience has proven that the ordinary arrangement of slasher can do good work to a certain limit. When that limit is reached, especially with sets having a small number of ends and with light yarn, it becomes necessary to use some such arrangement to do satisfactory work at a certain and constant speed. It can be readily attached to any slasher, and requires but little outlay. Its importance can be readily understood by those having experience with light warps or a small number of ends.

Sizes of Cylinders.

Slashers are built with the following sizes of cylinders:
2-Cylinders 5′ and 7′ diam. respectively by 60″ face.
2-Cylinders 4′ and 7′ diam. respectively by 60″ face.
2-Cylinders 5′ and 6′ diam. respectively by 60″ face.
2-Cylinders 4′ and 6′ diam. respectively by 60″ face.
1-Cylinder 7′ diam. by 60″ face.
1-Cylinder 6′ diam. by 60″ face.
Extra widths of face built to order.

Slasher Ventilating Outfits.—See Volume III., under the head of "**Mill Architecture and Engineering.**"

The Textile F. M. Co.'s Slashers, Continued.

Technical Data.

Production.—The production of a slasher varies greatly with the number and quality of the yarn and the number of ends of warp; generally speaking, however, one standard machine will size the warp for a weave mill on standard sheetings of 5,000 to 7,000 spindles and on finer grades of cloth up to 10,000 spindles.

The **driving pulley** is 16″ in diameter by 8″ face, and makes 200 revolutions per minute.

The **sizes of pipe** connections required are as follows:

Main steam pipe 1½″ diameter.

Outlet from trap 1¼″ diameter.

Steam supply pipe for size box ¾″.

There is no steam outlet from the size box.

Outlet for drawing off the size is 1″; a brass bib is supplied for this.

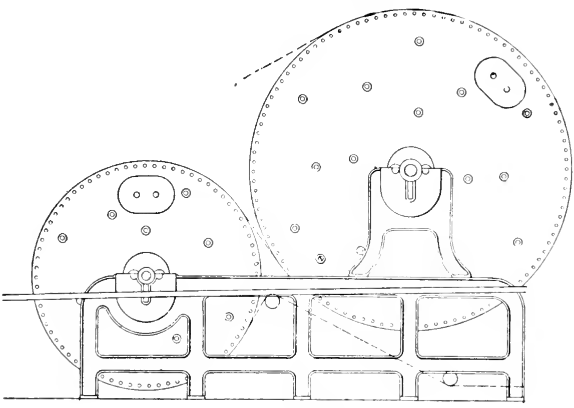
Outlet from size tank is tapped for a 2″ iron pipe.

Creels made to take more than eight sectional warper beams, if desired.

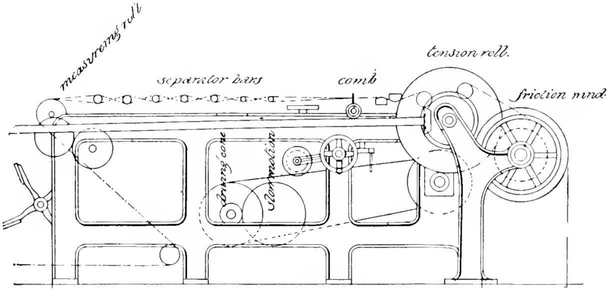
Machines are built either right or left hand, and to drive from either overhead or below.

Diagrams of Sections.

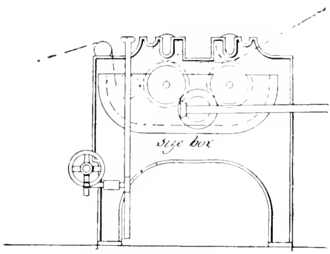
(For Floor Plan see page 227.)



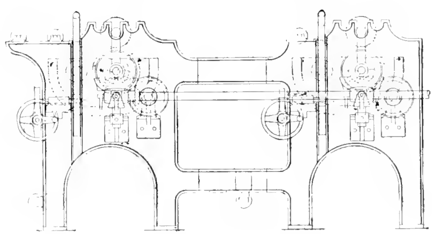
Cylinder Section.



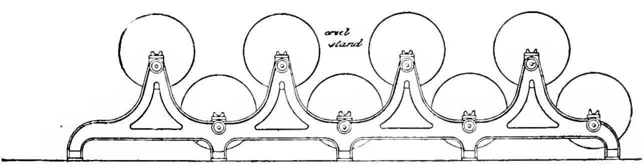
Head Section.



Single Size Box Section.

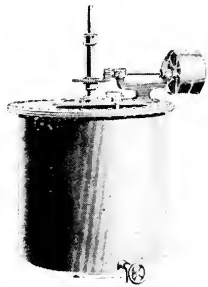


Double Size Box Section



Creel Frame Section.

The Textile F. M. Co.'s Size Kettles.



For properly mixing and boiling the size used for dressing warps, a size kettle is necessary.

These size kettles are usually of cast iron, made with hollow upright shaft and hollow horizontal stirrers. Both are perforated with small holes through which steam is forced to all parts of the kettle.

The steam is supplied through center shaft, the heat being distributed uniformly throughout the kettle, thus boiling all contents evenly.

The boiling can be done in one-half the time and one-half the expense necessary in any other arrangement now in use. The upright shaft is made of cast iron, the stirrers of brass tubing.

Made in the following sizes :

160 gallons capacity,
200 gallons capacity,
250 gallons capacity.

Driving Pulley, tight and loose, 8 inches diameter x 3 inch face.

Speed, 100 revolutions per minute.

Copper kettles can be furnished when desired.

Rotary Force Pumps,

(For Hot Size.)

These pumps are made with outside gearing and balance wheel if desired.

Overhead Tramway,

(With Differential Pulleys.)

These are for handling the section beams over the creels to the slasher, and are usually sixteen to twenty feet long. The pulley block travels on a specially designed carriage.

The Textile F. M. Co.'s Slashers, Concluded.

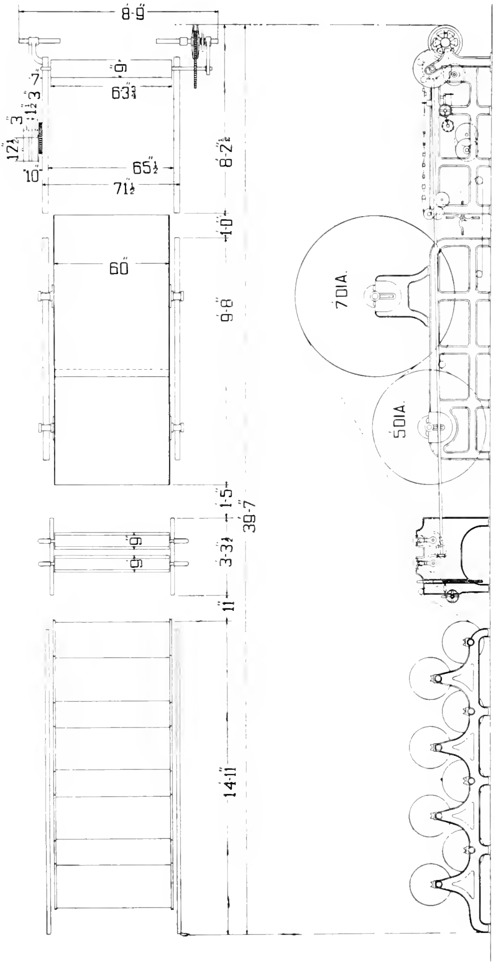


Diagram and Floor Plan of Standard Slasher.

The Textile F. M. Company's Tape Dressing Machine.

(For Dressing Warps.)

The cuts on the opposite page represents the improved tape dressing machine, designed especially for dressing warps for tickings, ginghams, and all pattern work when it is desirable to use a leese reed at size box. It takes the place of what is known to the trade as the "Scotch Tape Dresser."

The **head section** is similar to that of the slasher, provided cone improved friction wind for loom beam. slow motion, with driving to regulate speed, measuring roll, cut indicator, etc.

The **cylinder section** is provided usually with one 6 ft. diameter cylinder by 60 inch face, although when desired cylinders are furnished one 7 ft. or one 5 ft., or pairs of 7 and 5 ft. cylinders, or 7 and 4 ft. cylinders, or 6 and 4 ft. cylinders, all cylinders provided with spiral scoops, steam trap, pressure regulator, steam gauge, and safety valve.

When desired the McCarthy patent friction drive is furnished for cylinders. See page 223. This is adjustable in operation and can be so run as to produce no strain whatever on warp.

The frame is furnished with Phillips patent anti-friction bearings or ball bearings, as desired. same as slasher machine.

The **Brush frame** is furnished with one or two sets of brushes, as desired, brushes 12 inches diameter, and provided with small cleaner brushes both driven from side shaft.

The **size box section** is furnished with one double size box, with two nine inch copper size rolls and one copper immersion roll and Phillips all copper size box or cast iron box. Or, two single size boxes for colored work with one 9 inch copper size roll and one copper immersion roll in each.

Adjustable brackets are furnished for attaching leese reed. The leese reed is not furnished unless specially ordered, as parties often prefer to select their own design.

The **beam creel** or **rack** is furnished to take as many beams as desired It is mounted on wheels and can be moved to any desired position to accommodate the pattern. The machine is simple and easily operated.

Should occasion demand, this machine can easily be turned into a convenient slasher for small mills.

Pulleys, 12½ inch x 3 inch.

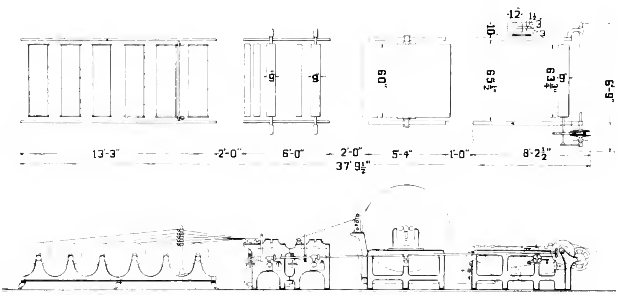
Speed, 300 revolutions per minute.

Extras:

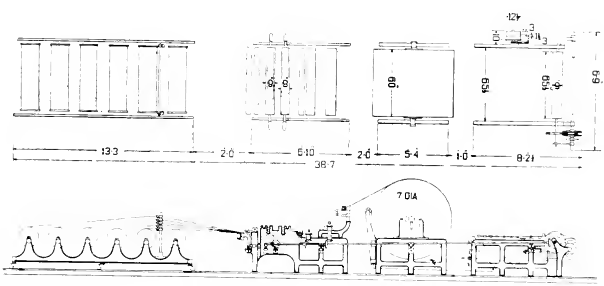
McCarthy patent friction drive. (See page 223.)
Pacific Wind.
Magnesia covered cylinder heads.
Roller or ball bearings, as desired.

The Textile F. M. Co.'s Tape Dressing Machines, Concluded.

Diagram and Floor Plans.

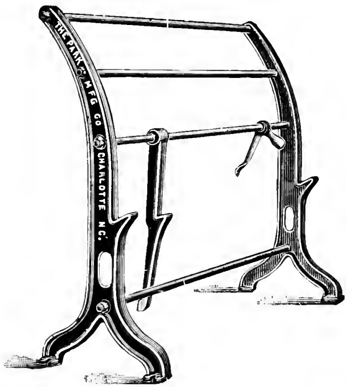


Tape Dresser, with Two Single Size Boxes, For Colored Work.



Tape Dresser, with Single Size Box, and with Brush Attachment.

DRAWING-IN FRAMES.



These are made of any size desired, but the standard frames are:

Height over all, - - -	55 inches.
Width for longest beam,	54 inches.
Overhang, - - - - - -	12½ inches.

They are, of course, adjustable so as to take in narrower beams.

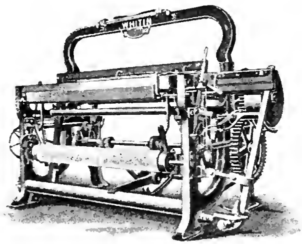
The beams are put on the frames, the warp threads lead over the top rail, and drawn through the eyes of the harnesses which hang suspended below; after which the threads are drawn into the reeds.

Automatic drawing-in frames have failed so far, owing to the difficulty of getting harnesses in which the eyes are perfectly aligned and all hang at the same angle.

LOOMS,

Manufactured by

The Whitin Machine Works.



New Heavy Pattern Loom.

(Designed for Standard Sheetings and Shirtings.)

The sides and arch of this loom are made very heavy in order to stand the high speed of running demanded, and the extra strain thereby induced. On account of this extra weight it will be found to be an excellent machine for standard goods where a large production is required. It has the ordinary cam harness motion, and by the use of a short auxiliary cam-shaft, geared to the main cam-shaft, can be readily and quickly changed to two, three, four, five or six leaf work as needed, the cams being made in sets that are interchangeable with each other to further facilitate this arrangement. Weavers who have been called upon to make changes in twill work can appreciate the advantages of this construction. The cam-shaft proper is not disturbed in the least, the necessary change gears being put on when loom is set up, thus doing away with all trouble of resetting pick cams, eccentric, cam-shaft boxes, etc. The cams themselves have been en-

Whitin Looms, Continued.

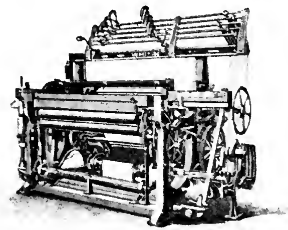
tirely remodeled, so as to give the easiest harness motion possible. When desired the loom is made with an adjustable arch, by means of which extra harness space may be obtained. This loom is usually built to "protect" from the breast beam but will, if so ordered, be built to "protect" at the side in which case the swell on the shuttle box is placed on the back of the lathe.

Radius of Cranks.—2″, 2¼″, 2½″, 2¾″, 3″. Side shaft tappet ball shuttle motion. Brake on driving pulleys. Beam heads 12″, 13″, 14″, 15″, 16″, 16½″ and 18¼″ diameter. Cut roll stands arranged for cuts 8″, 12″, 16″, 19″ and 22″ diameter. Improved Bartlett geared let-off motion or friction let-off. Shuttle boxes 18″ to 24″ long. Friction driving pulleys furnished if desired. Belt from above or below. Made to weave plain two-shade work ; also, 3, 4, 5 and 6 shade twill. The change pick motion is arranged so that one tooth in the gear stands for two picks in the cloth, i. e., 50 teeth in the gear give 100 picks in the cloth, etc. The gears range from 20 to 54 teeth, varying each one tooth. The pick motion may be arranged to give any required number of picks to the inch, but where more than 108 or less than 40 picks are wanted, the ratio between the change pick gear and the number of picks in the cloth, will not be constant as above. The tape selvage motion may be conveniently applied. The high cloth-roll may be had if desired.

Pulleys.—10″ to 15″ diameter, 2″ face, and run from 140 to 210 revolutions per minute.

Note :—See Tables of Production and Floor Space. Also Horse Power and Car Load Lots.

Whitin Looms, Continued.

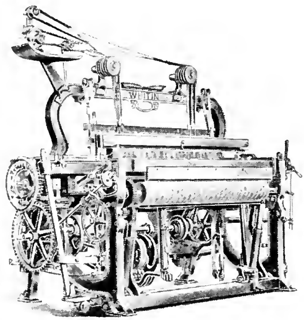


New Heavy Pattern Loom.

(With Outside Cams.)

It will be seen from the foregoing cut that the general construction of this loom is the same as that of our regular heavy pattern with Ponemah Side. The chief departure consists in placing the harness cams and treadles on the outside of the loom; the great advantage resulting therefrom being in the handiness and convenience of making changes where they are frequently required. The loom is built to weave plain 2 shade work, and also 3, 4, 5 and 6 shade twill. When used for 3 or 4 shade twill work, there is still room outside of the loom for a plain selvage motion. The outside cams are so arranged that they come inside the end of the lathe, so that looms built in this way do not require extra floor space on this account.

Whitin Looms, Continued.



Sateen Loom.

(For Weaving Sateens, Sheetings, Twills, Etc.)

This loom is built with either the Standard or Ponemah sides ; the latter having 3″ more harness space permits the use of dobbies with a large number of harnesses. The sides and girts are extra heavy, thereby reducing vibrations to a minimum.

The crank shaft is of large diameter and runs in boxes with caps which permits the removal of the shaft with little difficulty.

The lathe is built in a substantial manner and is provided with an extra heavy reed cap, iron race plate, and shuttle boxes with iron or wooden backs and adjustable front swells.

The warp beams are from 12″ to 17″ diameter, and are held in position by an improved retaining device.

Whitin Looms, Continued.

The let-off motion may be either the Bartlett or friction let-off or a combination of both.

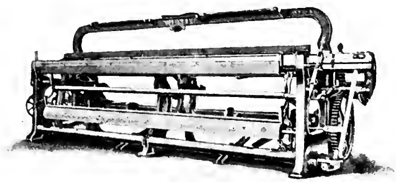
The harness motion is the same as that of the new heavy pattern loom. An improved top-rigged harness lifting device and also a scroll selvage motion may be conveniently applied if desired.

The take-up motion consists of a side shaft and worm, driving a worm ratchet gear; by the use of this motion the chance of skipping a tooth in the ratchet, as is sometimes the case with the ordinary ratchet gear, is entirely obviated. The pick gearing may be arranged to give any required number of picks per inch from 36 to 247 picks.

The cloth-roll motion consists of a sand-roll, 4½″ diameter, placed a short distance below the breast beam, and a cloth roll, held in movable bearings, pressed against the sand-roll by spiral springs which exert a constantly increasing pressure as the cloth roll increases in diameter. By the use of this motion access to the inside workings of the loom is easily had, and besides, wrinkling of the cloth as it is being wound is prevented to a great extent. A roll of cloth 13″ in diameter may be wound on this arrangement. The removal of the roll of cloth is easily accomplished, and may be done while the loom is in operation, by means of a worm, a few turns of which depresses the cloth roll holders so that the pressure is removed and the roll of cloth may be taken out and a new one started.

Other details same as the new heavy pattern loom.

Whitin Looms, Continued.



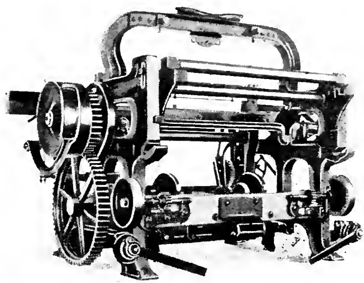
The Wide Loom.

(Designed for Wide Sheetings, Etc.)

These looms are intended to take the place of the old Lyall loom for weaving goods from 72″ to 130″ wide. They are built with a heavy side and are further strengthened with a middle tie. This loom has 4″ more harness space than the old pattern loom, and much heavier sides. The crank shaft is provided with three cranks, radius of which is 3″. A scroll pick motion with tappets is used, and has been made extra strong and effective. Looms are built with or without brake on driving pulleys. Beam heads 12″, 13″, 14″, 15″, 16″, and 16½″ in diameter. The wide looms are equipped with two beams, and to insure even tension of the yarn as it comes off both beams, are usually built with a compound let-off motion. Shuttle boxes 20″, 22″, or 24″ long. Arranged to belt from above or below and for plain two-shade work, or for 3. 4 or 5 shade twill work. When used for twills, the loom is built with an auxiliary shaft. The change pick motion is arranged in the same manner as in our other looms, that is, one tooth in the gear stands for two picks in the cloth, etc. The gears range from 20 teeth to 54 teeth, varying each one tooth.

Pulleys:—15″, 16″ and 17″ in diameter, 3″ face, and for 108″ loom run 90 revolutions per minute, varying correspondingly for other sizes.

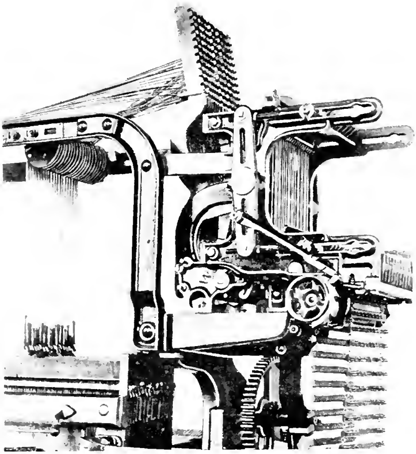
Whitin Looms, Continued.



Duck Loom.

This loom is designed for weaving sail cloth, canvas and other similar goods of 9 to 18 ounces per yard. It has very heavy frames, and extra strength is given to the wider patterns by the addition of a sampson in the centre. An efficient rope friction let-off is used which in connection with a nest of three fixed whip rolls of large diameters result in a uniform tension of the warp and of strength sufficient to hold the hardest weaves. The take-up motion is of strong and substantial design, the take-up or sand roll being of iron covered with perforated steel fillet.

Whitin Looms, Continued.



The Whitin Dobby.

(See also Appendix, page 318c.)

This Whitin Improved Dobby has several features which recommend its adoption by manufacturers of fancy cotton and silk goods.

The sides are of a substantial as well as of a pleasing design. They are rigidly connected by cross ties at the back and further strengthened by the hook racks bolted between them.

The harness levers, connectors and hooks are of ordinary construction, common to dobbies of the Hattersley model, the two latter being of malleable iron, thus combining lightness with strength.

The hook racks are so made that both the hooks and connectors are readily removed without the necessity of taking the dobby apart

The knives are connected to the rocker arms by wrought iron eye bars with swivel, adjustable joints whereby all backlash is easily taken up.

Whitin Looms, Continued.

A harness leveling device is provided of a simple and effective nature.

The power to drive the Dobby is transmitted by gearing from the crank shaft of the loom. This gearing is so situated that the danger of oil spattering on the warp is entirely avoided.

We build both the single and double index Dobbies of 8, 10, 12, 16, 20 and 25 harness capacities, and they may have either upright or horizontal harness levers.

Our Dobbies can be attached to any of the various patterns of Whitin looms, and also to looms of other makers. Twelve harnesses is the capacity of our Standard Pattern Loom, and twenty harnesses for our Ponemah Pattern, although sixteen harnesses in the former and twenty-five in the latter may be used by a little crowding.

Dobbies with upright harness levers are more generally used in preference to the horizontal lever Dobbies. The former is attached to the end of the loom and the latter to the top of the loom arch. The double index Dobby is more desirable for weaving long patterns, as it requires only half as many bars of chain as would be necessary to weave the same pattern on single index Dobby.

Whitin Looms, Continued.

Table of Floor Space Required for The Standard Whitin Looms.

Name of Loom.	Length of Lay.		*Width outside Breast Beam to outside 16½'' Warp Beam.		Distance between Swords.	Reed Space.	Est'm'ed Width of Cloth.
	Feet.	Inches.	Feet.	Inches.	Inches.	Inches.	Inches.
28in.	6	3⅝	3	6¾	35	33½	31.2
30	6	5⅛	3	6¾	36½	35	32.6
31	6	6⅝	3	6¾	38	36½	34.0
32	6	7⅝	3	6¾	39	37½	34.9
33	6	8⅝	3	6¾	40	38½	35.8
34	6	9⅝	3	6¾	41	39½	36.8
36	6	11⅝	3	6¾	43	41½	38.6
38	7	1⅝	3	6¾	45	43½	40.5
40	7	3⅝	3	6¾	47	45½	42.3
42	7	5⅝	3	6¾	49	47½	44.2
44	7	7⅝	3	6¾	51	49½	46.1
46	7	9⅝	3	6¾	53	51½	47.9
50	8	1⅝	3	6¾	57	55½	51.6
54	8	6⅛	3	6¾	61½	60	55.8
56	8	8⅛	3	6¾	63½	62	57.7
60	9	0⅝	3	6¾	68	66½	61.8
66	9	6⅝	3	6¾	74	72½	67.4
70	9	10⅝	3	6¾	78	76½	71.2
72	10	4	3	11¾	80	78½	73.0
74	10	7	3	11¾	83	82½	76.7
79	11	0	3	11¾	88	86½	80.4
80	11	1	3	11¾	89	87½	81.3
81	11	2	3	11¾	90	88½	82.2
82	11	4	3	11¾	92	90½	84.1
88	11	10	3	11¾	98	96½	89.7
90	12	0	3	11¾	100	98½	91.6
92	12	2	3	11¾	102	100½	93.4
98	12	8	3	11¾	108	106½	99.0
99	12	9	3	11¾	109	107½	100.0
100	12	10	3	11¾	110	108½	100.9
101	12	11	3	11¾	111	109½	101.8
107	13	6	3	11¾	118	116½	108.3
108	13	8	3	11¾	120	118½	110.1
124	15	0	3	11¾	136	134½	125.0

Whitin Looms, Continued.

Floor Space, Continued.

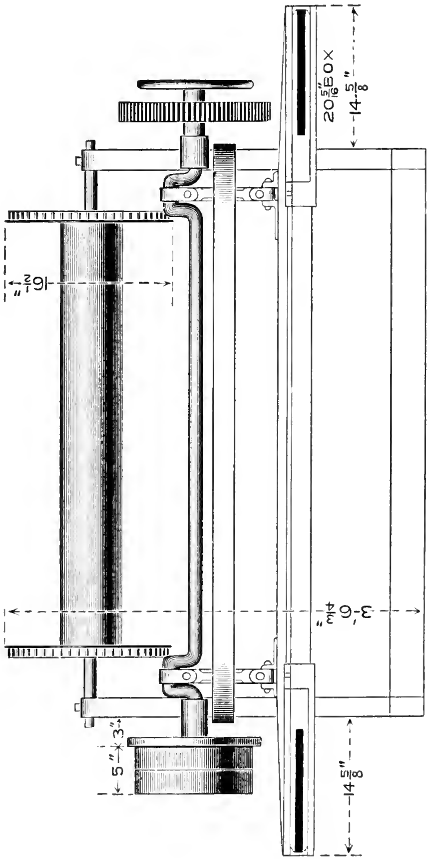
To obtain width from outside of Breast Beam to outside of 16½″ Warp Beam of the following styles of Looms, add the following number of inches to the figures given on the preceding page:

Wide Loom, Standard Pattern, - -	5¼ inches.
Wide Loom, Dwight Pattern, - -	3¼ inches.
Heavy Pattern Loom, Ponemah Side, -	3 inches.
Loom with outside Cams, Ponemah Side,	3 inches.
"Dwight Special," 18¼″ Beam, 19″ cut Roll,	1¾ inches.

Note:—The above table has for its basis our regular standard 40″ heavy pattern loom. The name of loom in the left hand column is so given largely for convenience, and the number of inches given is not intended to indicate the exact width of cloth, as this will vary according to quality of cotton used, number of picks, and number of yarn, etc. In the list above, 28″ to 72″ looms, inclusive, are assumed to have shuttle boxes $20\frac{5}{16}$″ long, which is a suitable length for 15″ shuttles. From 72″ upwards, a 22″ box is used. We make boxes 18″, 19″, 20″, 21″, 22″ and 23″ long, and when variations are made from sizes of boxes assumed as standards above, there will be a corresponding variation in the length of lay. Looms fitted with back-swell shuttle boxes have 20″ boxes.

Floor Plans:—See next page for floor plan of plain heavy pattern loom. The cut accompanies the table on this and the preceding page.

Whitin Looms, Continued.



Loom Floor Plan.

Whitin Looms, Continued.

Table of Speeds,

Recommended for Whitin Looms.

(On Medium Weight Cloth.)

Name of Loom.	Revolutions per Minute.	Name of Loom.	Revolutions per Minute.
28 in.	200 to 210	72 in.	116 to 120
30	195 to 200	74	114 to 116
31	190 to 195	79	112 to 114
32	185 to 190	80	110 to 112
34	180 to 185	81	108 to 110
36	175 to 180	82	106 to 108
38	170 to 175	88	104 to 106
40	165 to 170	90	102 to 104
42	160 to 165	92	100 to 102
44	154 to 158	98	98 to 100
46	150 to 154	99	96 to 98
50	142 to 148	100	94 to 96
54	140 to 144	101	92 to 94
56	138 to 140	107	88 to 90
60	132 to 136	108	86 to 88
66	126 to 130	124	75 to 80
70	120 to 124	150	65 to 70

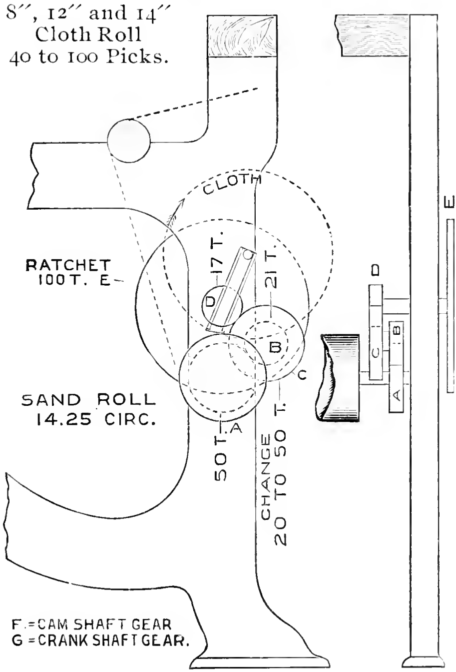
Whitin Looms, Continued.

Diagrams of Motions.

The following pages contain diagrams illustrating common styles of take-up and harness motions that may be applied to our looms. Diagrams of other styles will be sent on application.

Whitin Looms, Continued.

Standard Model.



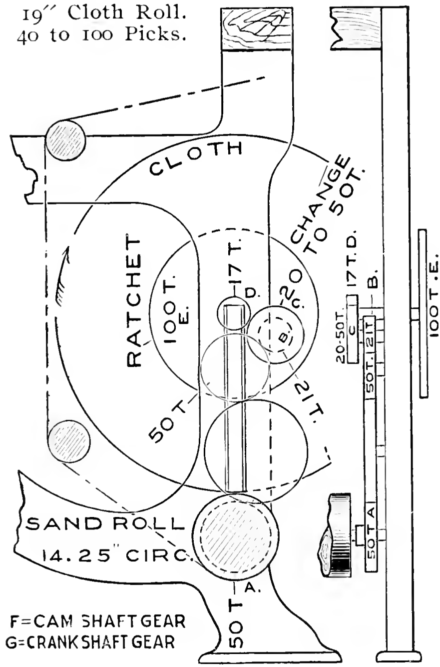
$$\frac{A.\times C.\times E.\times F}{B.\times D.\times 14.25\times G.} = \text{PICKS PER INCH.}$$

Change $\times$ 1.966 = Picks.
Picks $\div$ 1.966 = Change.
Eccentric on Cam Shaft.

Whitin Looms, Continued.

Standard Model.

19″ Cloth Roll.
40 to 100 Picks.



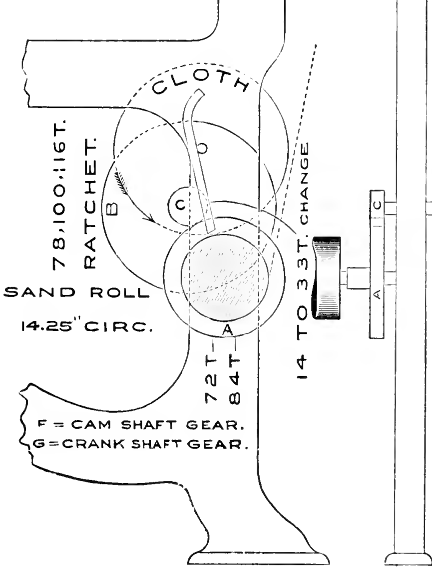
$$\frac{A. \times C. \times E. \times F}{B. \times D. \times 14.25 \times G} = \text{PICKS PER INCH.}$$

Change $\times$ 1.966 = Picks.
Picks $\div$ 1.966 = Change.
Eccentric on Cam Shaft.

Whitin Looms, Continued.

Old Model.

8'' to 12'' Cloth Roll.
24 to 98 Picks.



$$\frac{A. \times B. \times F.}{C. \times 14.25 \times G.} = \text{PICKS PER INCH.}$$

CONSTANTS

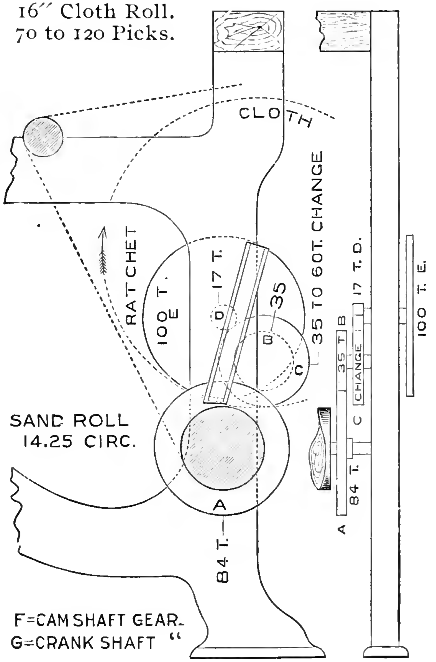
A.	B.	CON.	A.	B.	CON
72.	78	788	84	78	920
72.	100	1011	84	100	1179
72.	116	1172	84	116	1363

Eccentric on Cam Shaft.
Constant ÷ Picks = Change.
Constant ÷ Change = Picks.

Whitin Looms, Continued.

Newmarket Model.

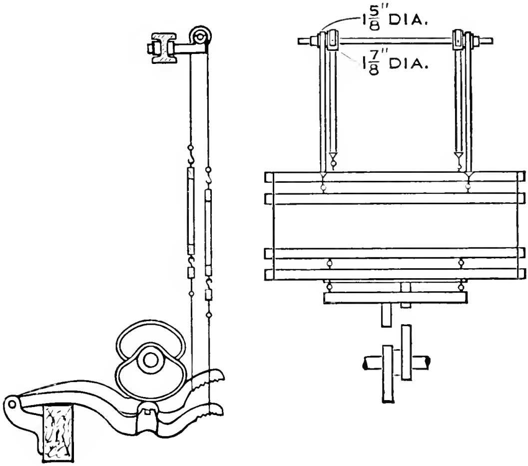
16″ Cloth Roll.
70 to 120 Picks.



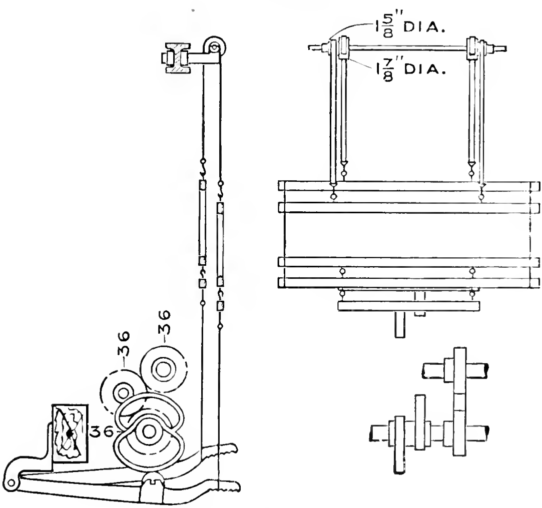
$$\frac{A \times C \times E \times F}{B \times D \times 14.25 \times G} = \text{PICKS PER INCH}$$

Change $\times$ 1.981 = Picks.
Picks $\div$ 1.981 = Change.
Eccentric on Cam Shaft.

Whitin Looms, Continued.

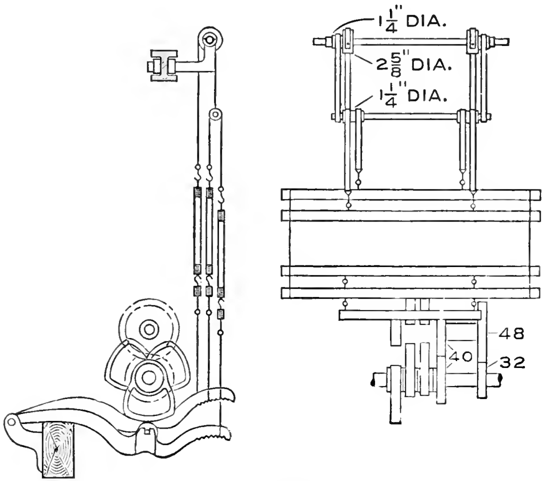


2 Harness Motion.

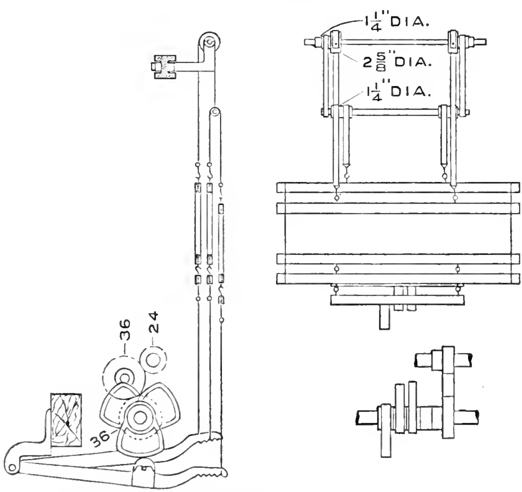


2 Harness Motion with Auxiliary Shaft.

Whitin Looms, Continued.

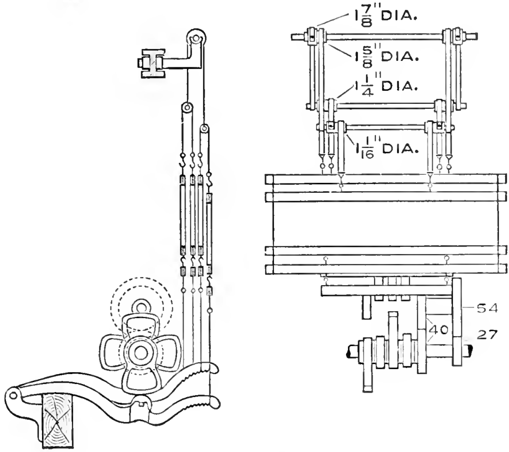


3 Harness Motion.

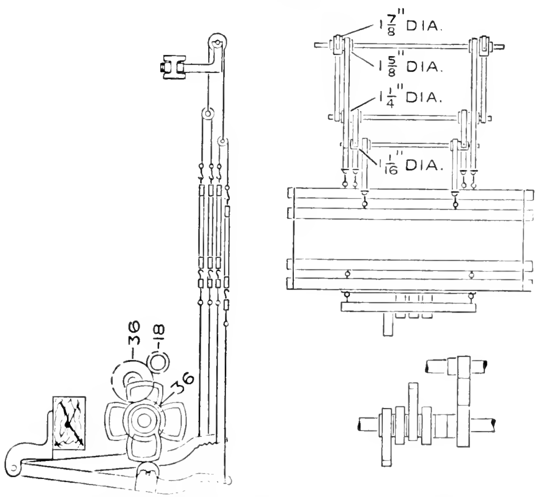


3 Harness Motion with Auxiliary Shaft.

Whitin Looms, Continued.

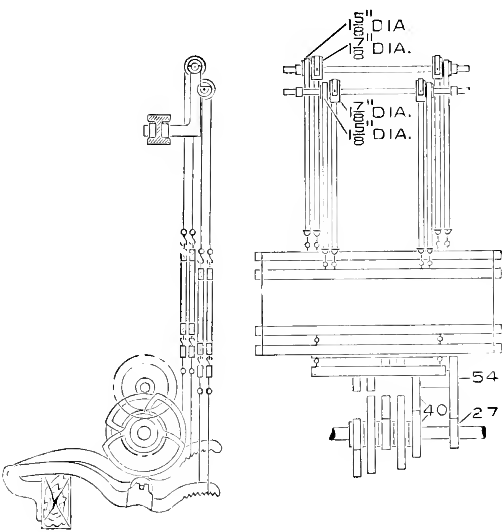


4 Harness Motion.



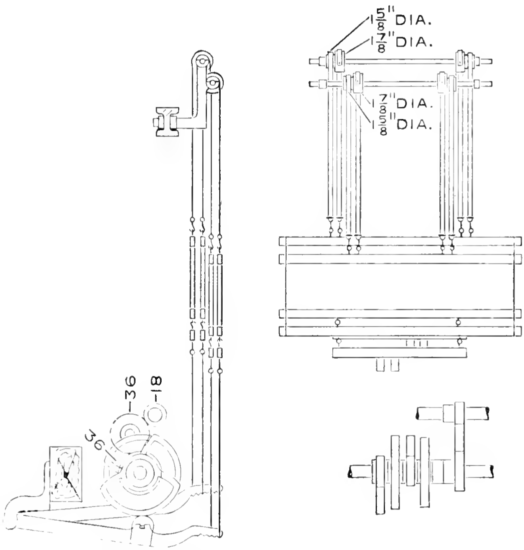
4 Harness Motion with Auxiliary Shaft.

Whitin Looms, Continued.



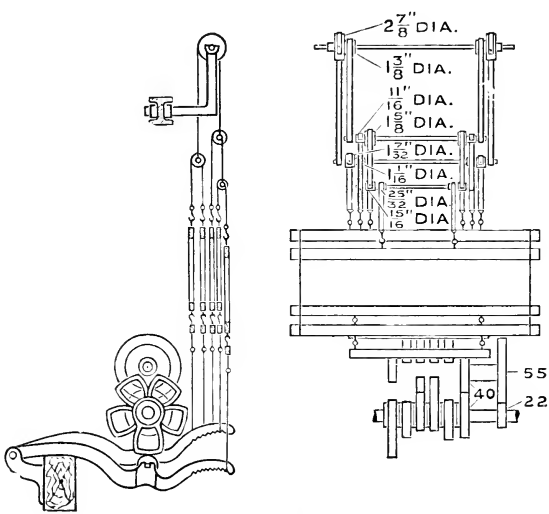
4 Harness Motion, 2 Up and 2 Down.

Whitin Looms, Continued.



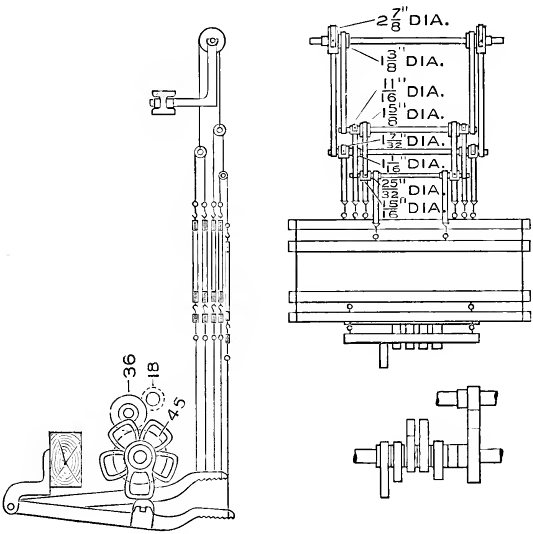
4 Harness Motion, with Auxiliary Shaft.
2 Up and 2 Down.

Whitin Looms, Continued.



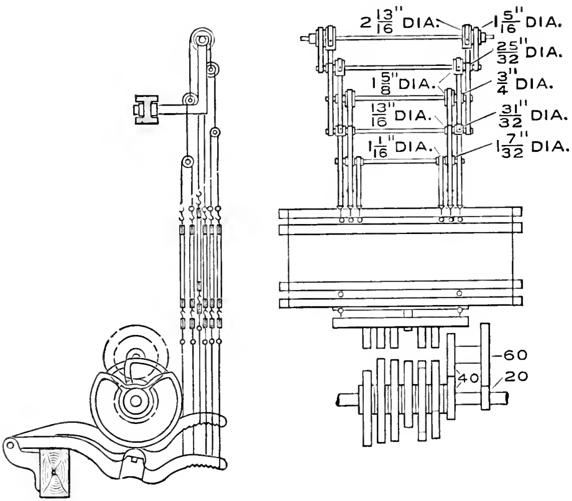
5 Harness Motion.

Whitin Looms, Continued.



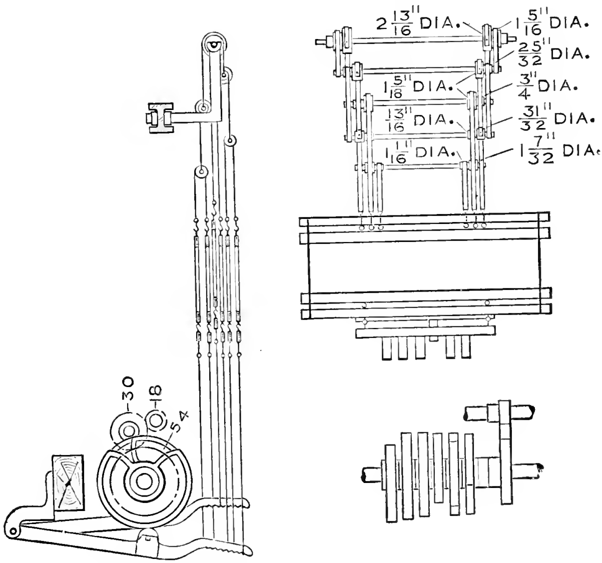
5 Harness Motion, with Auxiliary Shaft.

Whitin Looms, Continued.



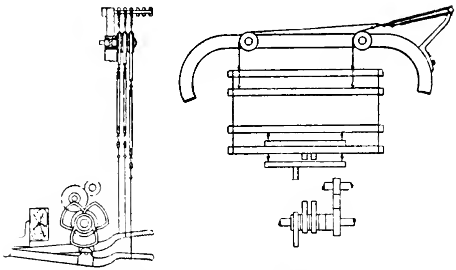
6 Harness Motion.

Whitin Looms, Continued.

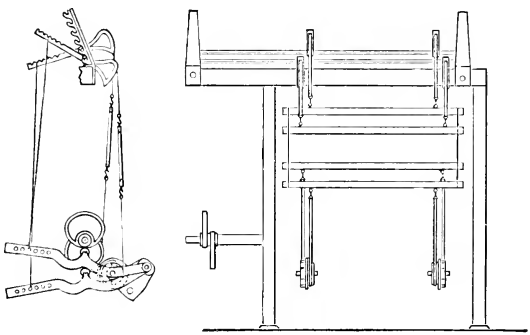


6 Harness Motion, with Auxiliary Shaft.

Whitin Looms, Continued.

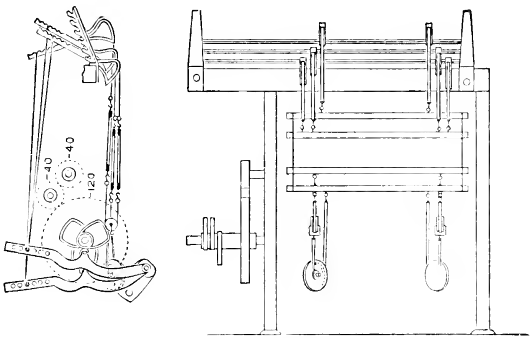


Spring Harness Motion.

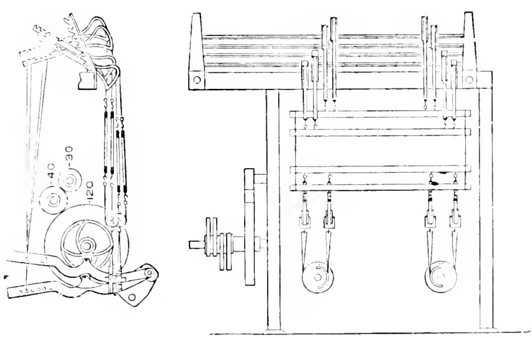


2 Harness Motion.
End Cam Loom.

Whitin Looms, Continued.

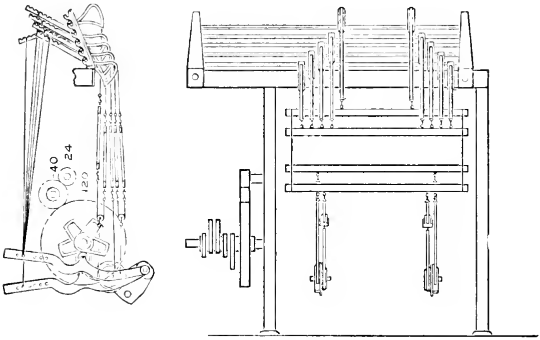


3 Harness Motion.
End Cam Loom.

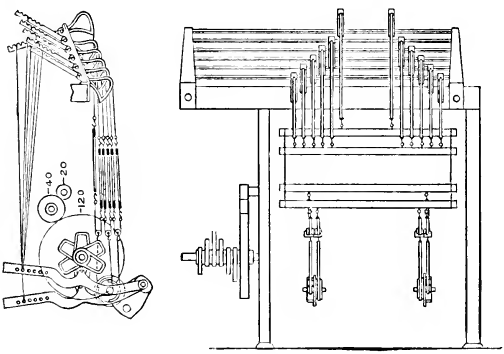


4 Harness Motion.
End Cam Loom.

Whitin Looms, Continued.



5 Harness Motion.
End Cam Loom.



6 Harness Motion.
End Cam Loom.

Whitin Looms, Continued.

The Whitin Loom.

Table showing the number of yards of Cloth produced in one day of 10 hours.

Revolutions of Crank Shaft per Minute.

Picks per Inch.	100	110	120	130	140	150	155	160	165	170	175	180	185	190	195	200	210	Picks per Inch.
	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	
30	50.0	55.0	60.0	65.0	70.0	75.0	77.5	80.0	82.5	85.0	87.5	90.0	92.5	95.0	97.5	100.0	105.0	30
32	46.9	51.6	56.3	60.9	65.6	70.3	72.7	75.0	77.3	79.7	82.0	84.4	86.7	89.1	91.4	93.8	98.4	32
36	41.7	45.8	50.0	54.2	58.3	62.5	64.6	66.7	68.8	70.8	72.9	75.0	77.1	79.2	81.3	83.3	87.5	36
40	37.5	41.3	45.0	48.8	52.5	56.3	58.1	60.0	61.9	63.8	65.6	67.5	69.4	71.3	73.1	75.0	78.8	40
42	35.7	39.3	42.9	46.4	50.0	53.6	55.4	57.1	58.9	60.7	62.5	64.3	66.0	67.9	69.6	71.4	75.0	42
44	34.1	37.5	40.9	44.3	47.7	51.1	52.8	54.5	56.3	58.0	59.7	61.4	63.1	64.8	66.5	68.2	71.6	44
46	32.6	35.9	39.1	42.4	45.7	48.9	50.5	52.2	53.8	55.4	57.1	58.7	60.3	62.0	63.6	65.2	68.5	46
48	31.3	34.4	37.5	40.6	43.8	46.9	48.4	50.0	51.6	53.1	54.7	56.3	57.8	59.4	60.9	62.5	65.6	48
50	30.0	33.0	36.0	39.0	42.0	45.0	46.5	48.0	49.5	51.0	52.5	54.0	55.5	57.0	58.5	60.0	63.0	50
52	28.8	31.7	34.6	37.5	40.4	43.3	44.7	46.2	47.6	49.0	50.5	51.9	53.4	54.8	56.3	57.7	60.6	52
54	27.8	30.6	33.3	36.1	38.9	41.7	43.1	44.4	45.8	47.2	48.6	50.0	51.4	52.8	54.2	55.6	58.3	54
56	26.8	29.5	32.1	34.8	37.5	40.2	41.5	42.9	44.2	45.5	46.9	48.2	49.6	50.9	52.2	53.6	56.3	56
58	25.9	28.4	31.0	33.6	36.2	38.8	40.1	41.4	42.7	44.0	45.3	46.6	47.8	49.1	50.4	51.7	54.3	58
60	25.0	27.5	30.0	32.5	35.0	37.5	38.8	40.0	41.3	42.5	43.8	45.0	46.3	47.5	48.8	50.0	52.5	60
62	24.2	26.6	29.0	31.5	33.9	36.3	37.5	38.7	39.9	41.1	42.3	43.5	44.8	46.0	47.2	48.4	50.8	62
64	23.4	25.8	28.1	30.5	32.8	35.2	36.3	37.5	38.7	39.8	41.0	42.2	43.4	44.5	45.7	46.9	49.2	64
66	22.7	25.0	27.3	29.5	31.8	34.1	35.2	36.4	37.5	38.6	39.8	40.9	42.0	43.2	44.3	45.5	47.7	66
68	22.1	24.3	26.5	28.7	30.9	33.1	34.2	35.3	36.4	37.5	38.6	39.7	40.8	41.9	43.0	44.1	46.3	68
70	21.4	23.6	25.7	27.9	30.0	32.2	33.2	34.3	35.4	36.4	37.5	38.6	39.6	40.7	41.8	42.9	45.0	70
72	20.8	22.9	25.0	27.1	29.2	31.3	32.3	33.3	34.4	35.4	36.5	37.5	38.5	39.6	40.6	41.7	43.7	72

NOTE:—In the above tables, 10 per cent. of the time is allowed for changing shuttle, cleaning, oiling, etc.

Whitin Looms, Continued.

The Whitin Loom. Continued.

Table showing the number of yards of Cloth produced in one day of 10 hours.

Revolutions of Crank Shaft per Minute.

Picks per Inch.	100	110	120	130	140	150	155	160	165	170	175	180	185	190	195	200	210	Picks per Inch.
	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	
74	20.3	22.3	24.3	26.4	28.4	30.4	31.4	32.4	33.4	34.5	35.5	36.5	37.5	38.5	39.5	40.5	42.6	74
76	19.7	21.7	23.7	25.7	27.6	29.6	30.6	31.6	32.6	33.6	34.5	35.5	36.5	37.5	38.5	39.5	41.4	76
78	19.2	21.2	23.1	25.0	26.9	28.8	29.8	30.8	31.7	32.7	33.7	34.6	35.6	36.5	37.5	38.5	40.4	78
80	18.8	20.6	22.5	24.4	26.3	28.1	29.1	30.0	30.9	31.9	32.8	33.8	34.7	35.6	36.6	37.5	39.4	80
82	18.3	20.1	22.0	23.8	25.6	27.4	28.4	29.3	30.2	31.1	32.0	32.9	33.8	34.8	35.7	36.6	38.4	82
84	17.9	19.6	21.4	23.2	25.0	26.8	27.7	28.6	29.5	30.4	31.3	32.1	33.0	33.9	34.8	35.7	37.5	84
86	17.4	19.2	20.9	22.7	24.4	26.2	27.0	27.9	28.8	29.7	30.5	31.4	32.3	33.1	34.0	34.9	36.6	86
88	17.0	18.8	20.5	22.2	23.9	25.6	26.4	27.3	28.1	29.0	29.8	30.7	31.5	32.4	33.2	34.1	35.8	88
90	16.7	18.3	20.0	21.7	23.3	25.0	25.8	26.7	27.5	28.3	29.2	30.0	30.8	31.7	32.5	33.3	35.0	90
92	16.3	17.9	19.6	21.2	22.8	24.5	25.3	26.1	26.9	27.7	28.5	29.3	30.2	31.0	31.8	32.6	34.2	92
94	16.0	17.6	19.1	20.7	22.3	23.9	24.7	25.5	26.3	27.1	27.9	28.7	29.5	30.3	31.1	31.9	33.5	94
96	15.6	17.2	18.8	20.3	21.9	23.4	24.2	25.0	25.8	26.6	27.3	28.1	28.9	29.7	30.5	31.3	32.8	96
98	15.3	16.8	18.4	19.9	21.4	23.0	23.7	24.5	25.3	26.0	26.8	27.6	28.3	29.1	29.8	30.6	32.1	98
100	15.0	16.5	18.0	19.5	21.0	22.5	23.3	24.0	24.8	25.5	26.3	27.0	27.8	28.5	29.3	30.0	31.5	100
102	14.7	16.2	17.6	19.1	20.6	22.1	22.8	23.5	24.3	25.0	25.7	26.5	27.2	27.9	28.7	29.4	30.9	102
104	14.4	15.9	17.3	18.8	20.2	21.6	22.4	23.1	23.8	24.5	25.2	26.0	26.7	27.4	28.1	28.8	30.3	104
106	14.2	15.6	17.0	18.4	19.8	21.2	21.9	22.6	23.3	24.1	24.8	25.5	26.2	26.9	27.6	28.3	29.7	106
108	13.9	15.3	16.7	18.1	19.4	20.8	21.5	22 2	22.9	23.6	24.3	25.0	25.7	26.4	27.1	27.8	29.2	108
110	13.6	15.0	16.4	17.7	19.1	20.5	21.1	21.8	22.5	23.2	23.9	24.5	25.2	25.9	26.6	27.3	28.6	110
112	13.4	14.7	16.1	17.4	18.8	20.1	20.8	21.4	22.1	22.8	23.4	24.1	24.8	25.4	26.1	26.8	28.1	112

NOTE:—In the above tables, 10 per cent. of the time is allowed for changing shuttle, cleaning, oiling, etc.

Whitin Looms, Concluded.

The Whitin Loom. Concluded.

Table showing the number of yards of Cloth produced in one day of 10 hours.

Revolutions of Crank Shaft per Minute.

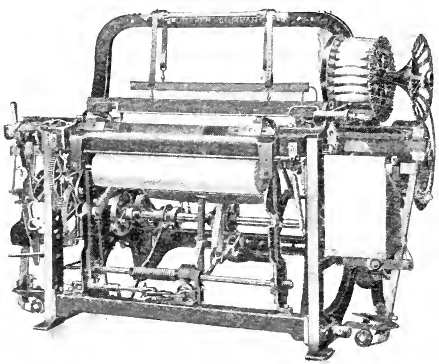
Picks per Inch.	100	110	120	130	140	150	155	160	165	170	175	180	185	190	195	200	210	Picks per Inch.
	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	YDS	
114	13.2	14.5	15.8	17.1	18.4	19.7	20.4	21.1	21.7	22.4	23.0	23.7	24.3	25.0	25.7	26.3	27.6	114
116	12.9	14.2	15.5	16.8	18.1	19.4	20.0	20.7	21.3	22.0	22.6	23.3	23.9	24.6	25.2	25.9	27.2	116
118	12.7	14.0	15.3	16.5	17.8	19.1	19.7	20.3	21.0	21.6	22.2	22.9	23.5	24.2	24.8	25.4	26.7	118
120	12.5	13.8	15.0	16.3	17.5	18.8	19.4	20.0	20.6	21.3	21.9	22.5	23.1	23.8	24.4	25.0	26.3	120
122	12.3	13.5	14.8	16.0	17.2	18.4	19.1	19.7	20.3	20.9	21.5	22.1	22.7	23.4	24.0	24.6	25.8	122
124	12.1	13.3	14.5	15.7	16.9	18.1	18.8	19.4	20.0	20.6	21.2	21.8	22.4	23.0	23.6	24.2	25.4	124
126	11.9	13.1	14.3	15.5	16.7	17.9	18.5	19.0	19.6	20.2	20.8	21.4	22.0	22.6	23.2	23.8	25.0	126
128	11.7	12.9	14.1	15.2	16.4	17.6	18.2	18.8	19.3	19.9	20.5	21.1	21.7	22.3	22.9	23.4	24.6	128
130	11.5	12.7	13.8	15.0	16.2	17.3	17.9	18.5	19.0	19.6	20.2	20.8	21.3	21.9	22.5	23.1	24.2	130
132	11.4	12.5	13.6	14.8	15.9	17.0	17.6	18.2	18.8	19.3	19.9	20.5	21.0	21.6	22.2	22.7	23.9	132
134	11.2	12.3	13.4	14.6	15.7	16.8	17.4	17.9	18.5	19.0	19.6	20.1	20.7	21.3	21.8	22.4	23.5	134
136	11.0	12.1	13.2	14.3	15.4	16.5	17.1	17.6	18.2	18.8	19.3	19.9	20.4	21.0	21.5	22.1	23.2	136
138	10.9	12.0	13.0	14.1	15.2	16.3	16.8	17.4	17.9	18.5	19.0	19.6	20.1	20.7	21.2	21.7	22.8	138
140	10.7	11.8	12.9	13.9	15.0	16.1	16.6	17.1	17.7	18.2	18.8	19.3	19.8	20.4	20.9	21.4	22.5	140
142	10.6	11.6	12.7	13.7	14.8	15.8	16.4	16.9	17.4	18.0	18.5	19.0	19.5	20.1	20.6	21.1	22.2	142
144	10.4	11.5	12.5	13.5	14.6	15.6	16.1	16.7	17.2	17.7	18.2	18.8	19.3	19.8	20.3	20.8	21.9	144
146	10.3	11.3	12.3	13.4	14.4	15.4	15.9	16.4	17.0	17.5	18.0	18.5	19.0	19.5	20.0	20.5	21.6	146
148	10.1	11.1	12.2	13.2	14.2	15.2	15.7	16.2	16.7	17.2	17.7	18.2	18.8	19.3	19.8	20.3	21.3	148
150	10.0	11.0	12.0	13.0	14.0	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20.0	21.0	150

NOTE:—In the above tables, 10 per cent. of the time is allowed for changing shuttle, cleaning, oiling, etc.

THE NORTHROP LOOM,

Manufactured by

The Draper Company.



(Although the Whitin Machine Works do not make this loom, a number of our customers using our other machinery have them in their mills, and therefore it seems desirable to have a chapter devoted to them in this book. The following is published by courtesy of the Draper Company.)

The essential points of difference between this and the ordinary types of looms are that it automatically supplies its filling and mechanically prevents faults in the warp.

The ordinary loom stops when the filling carried by its shuttle is broken or exhausted. It does not stop when warp threads break. The supply of filling in a shuttle will last, in usual weaving, from one minute to ten, depending on the size of shuttle, fineness of yarn, speed of loom and width of cloth. Warp threads will break with varying regularity according to conditions, averaging at least twenty per loom per day on ordinary goods.

Draper Looms, Continued.

A Filling Changer involves the following mechanisms:

A filling fork to detect fault or absence in the filling.

A hopper to hold an extra supply of filling.

A transferrer to transfer extra filling from the hopper.

A peculiar shuttle which will release the old filling carrier and properly receive the new, threading the yarn in its eye automatically.

A device to receive the spent filling carrier, involving a chute and box.

A device to protect the apparatus from damage in case the shuttle is not in proper position to receive a new filling supply.

A thread cutter to sever the thread extending from the hopper to the cloth when fresh filling is inserted.

A device to stop the loom in case filling is all absent from the hopper, or in case the shuttle fails to thread more than once successively.

The Warp Stop Motions are in several forms, all involving the same idea of stopping the loom in case any individual thread breaks or becomes unduly slack. They include drop wires, detectors and heddles, acting as follows:

In the Harness.

Back of the Harness.

Back of the Lease Rods.

In front of the Harness.

On the Lay.

In the Reed.

The stop motions largely in use are those in the Harness and immediately back or in front of them.

Dealing with the more important parts of the loom in turn, we first consider the Filling Changer, or Hopper, or Battery, or Magazine, as it is termed. This attachment furnishes the great element of labor saving. As recently improved, the hopper is designed to hold twenty-five extra bobbins, or cops, of filling, in place of fifteen as formerly. The new hopper is also much simplified in the detail of its mechanism, so that fewer and simpler parts perform the same work and with even greater accuracy than before.

The devices which co-operate with the Filling Changer, such as the shuttle, the bobbins, the cop skewers, the shuttle position detector, etc., have also been modified with good results. The shuttles are specially designed so as to be less liable to split or to be damaged, and the bobbins are

Draper Looms, Continued.

specially made with large butts, so that they wear better and change less in reaming.

The Warp Stop Motion is of various types. The now familiar steel harness style is probably superior for two-harness weaving on ordinary goods. It will not do for very close sley, for very wide goods, or for goods woven with a heavy strain on the warp, however. The drop-wire system, in which one detector operates for more than one thread, has been the most popular form for miscellaneous goods. There is also a single-thread stop motion, so called, which can be used with any number of harnesses.

There are various devices for matching the pick. The only sure method of making absolutely perfect cloth is to supply new filling before the old filling is absolutely exhausted. This is accomplished by the use of what is termed a "Feeler," which positively engages the filling in the shuttle while weaving, to determine when it has lost volume sufficiently to warrant the operation of the filling changer to insert a new supply. The objection that would naturally be raised to this is the amount of waste yarn left on the expelled bobbin : this is met by removal as waste, or by piecing up from these bobbins on the spinning frame.

Points of Importance:

For proper operation, the hopper must be positioned so as to deliver the bobbin, or cop skewer, properly into the shuttle. As left by the erecting men, the position is correctly gauged. The lay bearings may change, however, and if there is any fault in the operation of changing filling, the loom should be turned over by hand, to note just where the fault is. Duplicate gauges should be kept by the overseer, by which to check up any errors in position. Note carefully the delivery of the new bobbin by the transferrer, to see that it is put properly into place, without any contact of the transferrer with the shuttle. The adjusting screw on the latch, attached to the transferrer, allows considerable lee-way for adjustment. If the lay does not come forward sufficiently, the throw may be set by the eccentric bearing at the lay end of the pitman. If the pitman becomes too badly worn to allow proper adjustment, it should be replaced. If a badly worn

Draper Looms, Continued.

picker allows the shuttle to enter the box too far, an additional strip of leather should be placed in the box, behind the picker stick. It is better to keep the hopper continuously filled; that is, not allow gaps between the bobbins, although it may work all right without this care. The spring on the transferrer should be set with sufficient tension to prevent the blow of the lay from forcing the bobbin too far in the shuttle, by extra momentum.

If the shuttle spring gets loosened, tighten up the retaining screw. While this is a self-evident proposition, continual attention has to be called to it. With long bobbins, it is necessary to put some form of friction in the shuttle, such as bristles or slasher waste, inserted through holes in the sides. If the shuttle fails to thread, take pains to see whether the slot has become jammed, or the eye filled with lint. Shuttles often get broken because the protector is not properly set, allowing the side of the shuttle to be smashed in by the temple, when banging off. Another reason for shuttle splitting, is due to bobbins catching during transfer. This trouble is almost always due to improper position of the hopper, or to improper position of the shuttle with relation to the hopper. The shuttle position detector should protect one end, and the suitable insertion of leather back of the picker stick, the other end.

Greater care than usual must be taken with the pick of the Northrop looms, for many serious troubles with the filling are due to a hard pick, which will not only tend to snap the filling thread when picking the shuttle, after transfer, but will also tend to make the filling throw off of the bobbin, loop over the eye point, or get caught in cracks or on projections near the shuttle box. A proper check will, of course, counteract the effect of a harsh pick, more or less, and so will a tight shuttle box. The proper method, however, is to use as light a pick as possible.

Error in the warp-stop motion is easily detected by test with a drop detector at various portions of the warp. Faults in action will be found due to improper set of parts, damaged parts, or worn parts. Necessary repairs should be promptly attended to. Slack threads often cause trouble by stopping the loom too often. This may be due to improper tension of the let-off, or the position of whip roll with relation to the harness. The greater part of warp breakage is due to knots, and especially knots with long ends.

Draper Looms, Continued.

Most of the trouble with a loom is due to lack of oiling and lack of care in keeping parts properly adjusted. There is so much jar and shock with this machine, that nuts are apt to become loose, and bolts to slip. It is poor economy to allow badly worn parts to continue in use. If a change of goods is made, care must be taken to see that the let-off gearing is properly proportioned for the new work ; also that the take-up shall let back the proper amount. The position of the take-up roller and whip roll with relation to the lay is of vital importance, necessarily changing as the conditions change. In order to get face on the goods, sacrifices must be made in other directions.

Cloth Defects.

If Northrop loom cloth shows warp runs or pick-outs, there is no excuse, as the warp-stop motion should properly protect against such errors. Thin places would prove either that the filling fork was out of order, or that the shuttle eye has become clogged so as to continue mis-threading, unless a dragging end of filling (when coarse) has held the fork from action. Thick places would be caused by the let-off not working properly, or by the take-up failing to act. Other general defects may be due to oil stains, which are inexcusable, poor set of pick or harness cams, need of friction in the shuttle, improper templing, improper choice of harness cams for the goods, and improper position of the parts over and through which the warp threads run.

SPEED RECOMMENDED FOR DRAPER LOOMS FOR MEDIUM WEIGHT GOODS.

28″	190 to 195	60″	128 to 132
30″	185 to 190	64″	124 to 128
32″	180 to 185	68″	120 to 124
34″	175 to 180	72″	116 to 120
36″	170 to 175	76″	112 to 116
38″	165 to 170	80″	108 to 112
40″	160 to 165	84″	104 to 108
42″	154 to 158	88″	100 to 104
44″	148 to 152	92″	96 to 100
46″	144 to 148	96″	94 to 96
48″	140 to 144	100″	90 to 94
52″	136 to 140	104″	88 to 90
56″	132 to 136	108″	86 to 88

Draper Looms, Continued.

Instructions for Filling Out Specifications.

(Make out separate specifications for each size loom.)

Reed.—Send half a dozen pieces of different reeds, to help fit lay. Reeds vary so much, one piece is not sufficient. As the contraction on our high roll take-up is considerably less, on certain classes of weaves, than on other looms, it would be well to write the builders before ordering new reeds. The maximum reed space is 5″ wider than the size of the loom.

Bobbin or Cop.—It is necessary to send several sample cops with mule spindle, or bobbin and spindle. The regular sizes of bobbins take 5½, 6⅛ and 6¾ inch traverse. The regular cop sizes are 5½, 6⅛ and 6¾ inch traverse. At least 200 to a loom should be provided. When cops are used, twenty skewers are sent with each loom. These are charged extra. Special patented bobbins are required and must be ordered from the Draper Co.

Let-Off.—Bartlett, Shepard, Friction, or Bartlett and Friction combined is furnished. On F Model looms, Compound let-off is furnished.

Take-Up.—The "High Roll" construction admits of winding any diameter cloth roll up to 18 inches. Embodied with this are three separate styles of Take-up.

The regular pattern takes up with every pick, and lets back to prevent thin places.

The Worm Take-up is a positive take-up, without the let-back feature, and is especially designed for corduroys, velvets and similar fabrics, which require 200 picks per inch and above.

The Worm Take-up with Let-back is designed for those who require a positive take-up, and still desire the let-back feature.

Harness-Motion.—The regular top harness-motion or the side-top compensating motion is furnished.

Draper Looms, Continued.

This loom is also adapted to take the Stafford or Crompton Dobby.

Warp Stop-Motion.—There are three styles.

Steel harness for 2-shade work only, using one steel heddle for every warp thread.

Drop-wire stop-motion for cotton harness, which requires one drop-wire for every two warp threads in a two harness loom adapted for 2, 3, 4 and 5 harness work.

Single Thread or Lease Rod stop-motion for cotton harness, using one drop-wire for every warp thread. This stop-motion is adapted for any number of harness from 2 up.

Drop-wires and heddles are extras, and should be ordered in sufficient quantities for extra drawing-in sets. It is well to order about 20 per cent. more drop-wires or heddles than the looms figure for this purpose.

Pulleys.—Regular size 12 inch diameter, 2¼ inch face, for 28 inch loom. 14 inch diameter, 2¼ inch face, for 40 inch loom. This width of face is strongly recommended as wider pulleys are much more troublesome in shifting belts.

Equipment.—Looms are furnished with filling-changer, warp stop-motion, check stands. shuttle-guard, filling-forks, one shuttle, one and one-half beams per loom. No leather parts.

Pickers.—Pickers must be of short pattern, not projecting above shuttle box. Sample sets of strapping and pickers are furnished without charge.

The different Loom Models are as follows :

A Model.—Like those at Queen City Mill and other early orders.

B Model.—Standard up to 1898.

D Model.—Heavy Pattern. Present standard.

E Model.—Regular Pattern. Present standard.

F Model.—Extra Heavy Pattern. Recommended for 72-inch goods and wider.

H Model.—Heavy Pattern. Side Cam Loom.

Draper Looms, Concluded.

Northrop Loom Dimensions. E, D and H Models.

Size.	Length of Lay for 14½ in. Shuttle. 6¾ in. Bobbin.	Length of Lay for 15⅛ in. Shuttle. 7⅜ in. Bobbin.	Length of Lay for 15¾ in. Shuttle. 8 in. Bobbin.	Total Length of Harness Shaft.	Greatest Width of Cloth at Temple.	Proper Width Between Beam Heads.
28 in.	76 in.	77¼ in.	78½ in.	34 in.	31 in.	32 in.
30 in.	78 in.	79¼ in.	80½ in.	36 in.	33 in.	34 in.
32 in.	80 in.	81¼ in.	82½ in.	38 in.	35 in.	36 in.
36 in.	84 in.	85¼ in.	86½ in.	42 in.	39 in.	40 in.
40 in.	88 in.	89¼ in.	90½ in.	46 in.	43 in.	44 in.
50 in.	98 in.	99¼ in.	100½ in.	56 in.	53 in.	54 in.

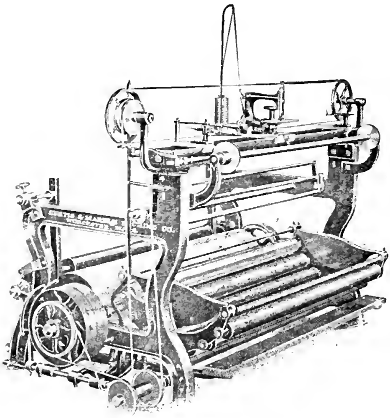
Depth of Loom from full 18-inch Yarn Beam to 18-inch Cloth Roll: E Model, 50⅛; D and H Models, 53¼.
For proper width between Beam Heads, 4 inches more than size of Loom is recommended. For those desiring extra space, Beams 5½ inches wider than size of Loom are supplied.

F Model Loom Dimensions.

Size.	Length Over All.	Available Space for Harness Shaft.	Greatest Width of Cloth at Temple.	Proper Distance Between Outside Heads of Yarn Beams.
72 in.	126 in.	79 in.	75 in.	78 in.
76 in.	130 in.	83 in.	79 in.	82 in.
82 in.	136 in.	89 in.	85 in.	88 in.
90 in.	144 in.	97 in.	93 in.	96 in.
100 in.	154 in.	107 in.	103 in.	106 in.

Largest diameter of Cloth Roll, 17 inches. Largest diameter of Yarn Beam, 16½ inches.
Largest distance between Beam Heads (outside Heads) 6 inches more than size of Loom.
Depth of Loom from full 16½-in. Yarn Beam to 17-inch Cloth Roll, 54⅝ inches. Use two Beams in a Loom.

CURTIS & MARBLE
CLOTH ROOM AND FINISHING MACHINERY.



Railway Sewing and Rolling Machine.

The cloth from the loom is placed in the cradle in front, the ends are stitched together as fast as it is unrolled from the loom-bolt, and then as many pieces as desired are rolled up in a large roll ready for the Brushing, Shearing, Folding Machines, etc., or for shipment to the bleachery. Before being sewed, the cloth is drawn out to its full width, and held smooth and straight by steel pins on the machine. The sewing-machine head then travels across it (the cloth remaining stationary), and sews the ends together with a continuous chain-stitch, making a perfectly straight and even seam all the way across.

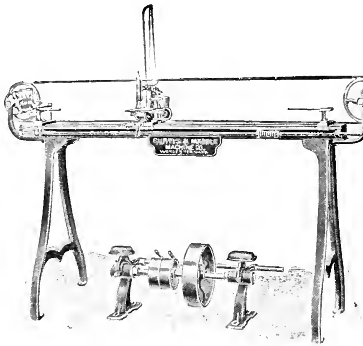
The machines are adjustable for different widths of cloth.

The cloth-cradle in front will take in any size roll up to 18″ diameter.

A folding attachment may be put on to lay the goods off in loose folds, if desired. Also a measuring attachment.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Railway Sewing Machine.

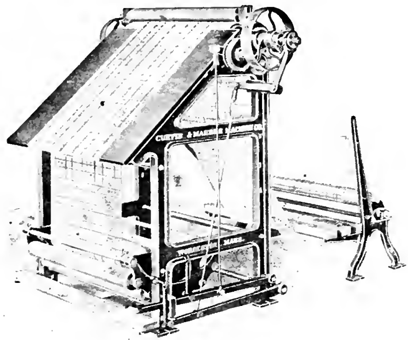
The sewing is done on the same principle as on the machine already described, and the same style of sewing-machine head is used. The sewing-machine head then travels across it and sews the two ends together with a continuous chain-stitch, stopping automatically at the end of each seam: a small hand-wheel is then turned, and the sewing-machine head drawn back to the starting-point at the left-hand side of the machine ready for the next seam. The machine is readily adjusted for different widths of goods.

This style of machine is very convenient for stitching together the goods, where they are not to be rolled up afterward.

A **countershaft** to go overhead, with hangers, tight and loose pulleys and pulley for driving the sewing machine, is regularly furnished with each machine.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.

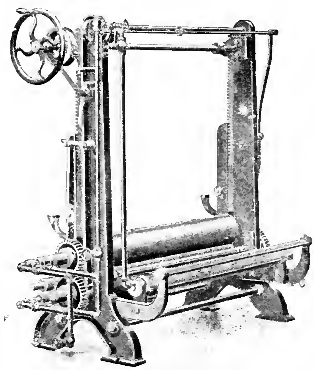


Inspecting Machine.

This machine is for the convenient and rapid inspection of the goods, whether in single pieces as they come from the loom, or when running from a large roll during the various processes of manufacture. It is intended more especially for use on goods that are put through a Brushing or Shearing Machine where the threads and dirt are removed. The cloth is placed in the cradle, or on stands in front of the machine, and is then drawn over the table in full view of the operator and rolled up on brackets at the back of the machine ; or, if preferred, a folding arrangement may be put on to lay the goods off in loose folds. The pulley on the draft roll is provided with a friction clutch, and this roll is quickly stopped and started by the foot of the operator on the treadle-board in front. There is also a reverse motion operated by the side treadle by which the direction of the draft roll is reversed, when desired, and the goods run back over the table ; this is a very desirable and convenient feature, enabling any imperfections which may be noticed near the upper part of the table to be run back and more carefully examined.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Calender-Rolling Machine.

(With Hot Rolls and Steam Vapor Cylinder.)

These machines are intended for smoothing out cotton goods and rolling them up in a smooth, hard and even roll. They are generally used with a steam vapor cylinder, and as the cloth enters the machine it is drawn over spreader bars and slightly dampened; it then passes down under the bottom roll, up between the two rolls, and around the top roll to the wooden roll, on which it is wound up. The iron rolls are driven by heavy gearing, and two sets of connecting gears are furnished with each machine; one set drives the rolls at the same surface speed, while the other set drives the top roll a trifle faster than the lower one, sufficient to draw out wrinkles, puckers and temple marks before rolling up. By treating the goods in this way and letting them remain on the rolls for a few hours, or over night, when taken off the rolls they present a much smoother and better appearance and finish to place on the market. A pair of long racks rests on the ends of the wooden roll on which the cloth is wound,

Curtis & Marble
Cloth Room Machinery, Continued.

and the requisite amount of pressure for making as hard a roll as desired is obtained by a friction strap and cam at the top ; the amount of pressure is easily regulated as required for different classes of goods.

The machines are made to be run either with cold rolls or are fitted with stuffing boxes, piping and valves ready for connections so as to let steam inside both rolls and have them hot when running. The machines with the steam rolls are usually made considerably heavier than the cold ones, and on almost all classes of goods will give a better and softer finish, as they have a hot ironing effect instead of a cold one. The steam rolls may also be used cold if desired.

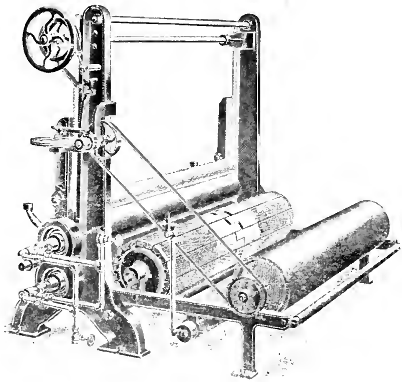
The Steam Vapor Cylinder lets a light vapor of steam onto the goods just before entering the machine, and aids in smoothing out the goods and giving them a softer finish and feel. The amount of steam is easily regulated, so that the goods may be dampened in this way without giving them the harsh feeling often occasioned by the use of water. A cut-off valve is attached to the steamer to shut off the steam when the machine is stopped, and thus avoid excessive steaming or wetting in one place.

These machines are run either in connection with a Shearing or Brushing Machine where the processes of cleaning and brushing the goods and then rolling them up in a hard roll are done at one operation, or they may be used independently with tight and loose pulleys.

These Calender-Rolling Machines are of decided advantage for all goods that are sold in the brown, or that are not further treated and finished.

See "**Floor Plan and Notes**" for floor space required, size and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Calender-Rolling Machine.

(With Measuring Roll, Steamer and Revolving Stretch Roll.)

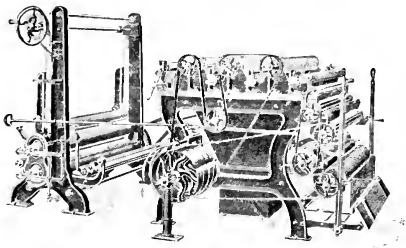
The above cut shows our Calender-Rolling Machine, the same as previously described, with the addition of an adjustable measuring attachment, and revolving stretch roll in the front.

The Adjustable Measuring Attachment consists of a measuring roll usually made one yard in circumference, with an expansion pulley on the end, and attached to the side of the machine is the measuring dial, which is generally made to register 2,500 or 5,000 yards, as desired; the expansion pulley may be varied in diameter, and as some goods are more elastic than others and consequently stretch more in running, the size of the pulley may be so adjusted as to give an accurate measurement of any kind of goods as they are rolled up.

The Revolving Stretch Roll is made with wooden slats on the outside and brass trucks and slides on the inside, so as to turn easily.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Cotton Brusher.

(With Calender-Rolling Machine.)

The Cotton Brushing Machine shown in above cut is arranged with one pair of Emery Rolls and one pair of Beaters in front, and with two Card Rolls and one stiff Brush on top for each side of the goods to finish them by once running through. It may also be made with other arrangements of Card Rolls and Brushes, or with all Brushes, if desired. On nearly all new machines made at the present time, we attach the Emery Rolls and Beaters, which are valuable additions for more thoroughly cleaning the goods, and require almost no additional floor space. The Emery Rolls do good service in removing motes, leaf, chits, etc., and are used especially for the medium and heavier classes of goods, such as sheetings, shirtings, drills, ducks, etc.; for finer goods, brushes may be put on in place of the emery rolls, or only the beaters used in front. The Beaters have steel blades with sharp edges, which run against the goods and knock off many of the knots and knubs which it is almost impossible to get off by other means, as well as loosen much of the other dirt so that the card rolls and brushes which follow may take it off. They have proved very effective in connection with the other cleaning appliances, and are used to advantage on quite fine goods as well as on coarser grades. The Emery Rolls and Beaters may also be added in similar manner to older machines to enable them to do more effective work.

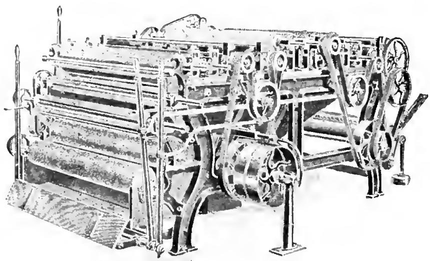
Curtis & Marble
Cloth Room Machinery, Continued.

The Brushes are set with the very best quality of Russian stiff bristles, which are the only bristles that will do effective work on cotton goods ; softer and cheaper bristles are sometimes used in cotton brushing machines, but, beyond brushing off loose lint and dirt, are of but little service for cleaning the goods. The Card Rolls are covered with fillet made expressly for this work, with straighter teeth than usual, and are run with the bend of the teeth pointing backwards, making good appliances for removing chits, motes, specks, etc., without raising a nap. The machine is entirely covered on top, and around the emery rolls and beaters (the covers being removed in the cut in order to show the different rolls, etc.), and has a powerful Exhaust Fan underneath to carry off dust and lint, leaving the room free from anything arising from the machine. The Brushing Machines are made with rolling-up brackets attached to the back side for winding the goods on rolls, or are run in connection with our Calender-Rolling Machines, as shown in the cut, where the work of both machines is done in one operation. The iron rolls of the Calender Head may be made to run either cold or hot, as desired, and with the above arrangement the goods are first thoroughly brushed and cleaned, then passed over a steam vapor cylinder to receive a light vapor of steam, and then in passing around the iron rolls of the Calender Head are freed from wrinkles and puckers and rolled up in a smooth, hard and even roll ; after being treated in this way and allowed to stand tightly rolled up for a few hours or over night, when taken off the rolls the goods have a much smoother and better finish and " feel " to place on the market. The work of the Calender-Rolling Machines is more fully described on a preceding page.

The Brushing Machines with the different cleaning appliances make very effectual and complete machines, and if Shear Blades are also desired, we can add them in almost any desired number and arrangement for either one or both sides of the goods.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Cover over top and front removed to show parts.

Cotton Shearing and Brushing Machine.

(With One Emery Roll, One Beater, One Card Roll, Two Brushes, and Two Sets of Shear Blades for One Side of the Goods, and One Emery Roll, One Beater, One Card Roll, Two Brushes, and One Set of Shear Blades for the Other Side, With Rolling Brackets.)

We illustrate but two of our many arrangements of Cotton Shearing and Brushing Machines; we build them with almost any desired arrangement of parts and attachments, with from one to six sets of shear blades and one to three brushes to shear but one side at a time, or with one or more sets of shear blades and brushes for the opposite side, to finish both sides by once running through. We also add Emery Rolls, Card Rolls, Beaters, Extra Brushes, etc., arranged in various combinations to suit the different classes of goods and the amount of cleaning and finishing required. The above cut shows a machine with many of the different attachments on, and we also build larger machines with more Shear Blades, etc., on them. The Front Attachment with Emery Rolls and Beaters is used on very many Brushing and Shearing Machines, and while requiring almost no additional floor space is a valuable addition to the machines

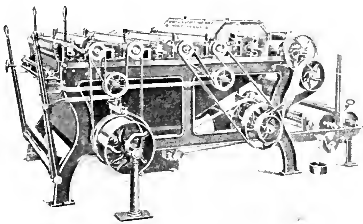
Curtis & Marble

Cloth Room Machinery, Continued.

for more thoroughly cleaning the goods. The Emery Rolls do good service in removing motes, leaf, chits, etc., and are used especially on the medium and heavier classes of goods, such as sheetings, shirtings, drills, tickings, ducks, etc. The Beaters have steel blades with sharp edges, which run against the goods and knock off many of the little knots and knubs which it is difficult to get off in other ways, as well as loosen much of the other dirt, so that the card rolls, brushes, etc., which follow may take it off. They are of great value in connection with the other cleaning appliances, and may be used to advantage on quite fine goods as well as on coarse. The Card Rolls are covered with fillet, having less bend to the teeth than usual, and are run with the bend of the teeth pointing backwards, so as not to raise a nap. They are effective for removing threads, specks, chits, etc. The Brushes are filled with the best Russian stiff bristles, which will do the most effective work of any bristles in cleaning cotton goods. The Shear Blades are for trimming off the threads and fibres, and are carefully made and tempered, and tested before being used. Where different kinds of goods are made and some of them do not require as much finishing as others, by changing belts, or taking off some of the belts entirely, either the Emery Rolls, Card Rolls, Beaters, or Shear Blades may be stopped, and as many parts of the machine used as will best adapt it to each grade and variety of goods. The Shearing Machines have Exhaust Fans underneath to carry off dust and lint, and have covers over the top and around the Emery Rolls and Beaters in front to keep the room free from anything arising from the machine. They have swing cloth rests and a stop motion for the revolvers, which are desirable improvements to prevent cutting the cloth when the seams go through. The machines are made with Rolling Brackets at the back side, as shown in the cut, or are run in connection with our Calender-Rolling Machines or Gas-Singeing Machines.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Cover over top and front removed to show parts.

Cotton Shearing and Brushing Machine.

(With Four Sets of Shear Blades, Three Brushes for the Face of the Goods, and One Brush for the Back of the Goods, with Horizontal Rolling Brackets.)

This machine makes a very satisfactory arrangement for printeries, bleacheries, cloth-rooms, etc , where but one side of the cloth is to be sheared. Many of the older styles of machines for bleacheries, printeries, etc., were made with brushes and shear blades for only the face of the cloth, but on more recent machines one or more brushes are generally added for the back of the goods, since the face and back of the cloth come against each other when rolled up, and if dirt or lint is left on the back of the goods, more or less of it is liable to come off on the face when the goods are unrolled,

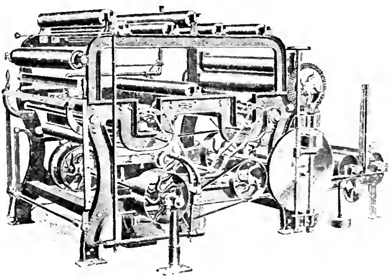
Curtis & Marble
Cloth Room Machinery, Continued.

and thus cause trouble in the after processes. We have also similar machines to these with two, three, four, five, or six sets of shear blades for the face, and with any desired number of brushes for both the face and the back of the goods. Additional brushes, beaters, or other cleaning appliances may also be put onto the front of the machine, if desired.

Our Shearing Machines are made with swinging cloth-rests and stop-motion for the revolvers, so that the cloth-rests may be raised or the revolvers stopped when seams pass through. The cloth-rests, brushes, etc., are held in adjustable boxes so that they can be readily set for any class of goods Special attention is given to the cutting parts, the spirals in the revolvers and ledger blades being made from the best quality steel, carefully tempered and finished. On machines for shearing only one side of the goods, a cover is generally placed over the back brush, as shown on the cut, and the balance of the machine left open, so that the operator may see the work done by the brushes and cutting parts, while on machines for shearing both sides of the goods, the cover usually extends over the entire top of the machine. Underneath the machine is an exhaust fan for taking off dust and lint. Levers are provided at both sides of the machine for starting and stopping the machine as well as for lifting the cloth-rests or stopping the revolvers when seams go through. Spreader-bars are attached both on the front of the machine where the cloth enters, and at the delivery end just before the cloth is rolled up, for taking out wrinkles and turned edges.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.



Improved Gas Singeing Machine.

This cut represents our Improved Gas Singeing Machine, which has proved a most complete and efficient machine for singeing all classes of goods. The Burners have a continuous slot their whole length, and give a solid and uniform sheet of flame from selvage to selvage: there are brass slides which go over the ends of the burners to shorten the flame when singeing narrow goods so that it may be no wider than the goods, and all waste of gas at the ends of the burners is avoided. Each flame comes in contact with the goods at two points so that the heat from both sides of the flame is utilized, and as the flame strikes the goods when running first in one direction and then in the opposite direction, the fibres are removed in the most thorough and efficient manner possible. A fine and close singe can be obtained on these machines with a less consumption of gas than by any other system of singeing.

The machines are so arranged that either one or both sides of the goods may be singed, as required; on machines with two burners, when singeing only one side, the goods have four contacts with the flames, or when singeing both sides they have two contacts on each side at each passage through,

Curtis & Marble
Cloth Room Machinery, Continued.

and on larger machines proportionately more contacts are obtained.

A Fan Blower and Air Reservoir are attached to the machine to give a constant supply of air under steady pressure to mix with the gas, so that a maximum amount of heat is obtained with a minimum quantity of gas, and at the same time the combustion is rendered complete, so that there is no smoke or soot to soil the goods. The amount of gas and air required is easily regulated by stop-cocks. The machines may be quickly stopped and the burners turned away from the goods by means of levers to prevent damage to the goods while the machine is not running ; these levers are so arranged that the burners must be turned before stopping the machine. Small lighter-pipes are provided, by means of which the flames are re-lighted when the burners are thrown back into working position.

The burner-rolls around which the goods pass as the flame acts on them may be kept cool by a continuous stream of water passing through them to present a cold surface against the back of the goods and prevent the flame from penetrating the goods to "exhaust" them. The carrier and burner-rolls are made of brass to prevent rust or stain on the cloth.

Where varieties of goods are being singed, the machine may be made with differential friction plate, as shown in cut, so that the speed of the cloth may be changed at pleasure ; this allows different classes of goods to be run at any desired speed, according to the amount of singeing required, and whether one or both sides are being singed. The machines are also built with cut gearing for driving the draft roll, and cone pulleys on the shafts underneath, allowing several changes of speed ;—this is a little easier method of driving, though does not allow as wide a range of speeds.

A Steaming Apparatus is placed directly after the last burner, to let a vapor of steam on the goods after being singed : or a Water-Box may be used at the back side.

The machine is made with either a rolling attachment, as shown on the cut, as is most commonly used for cotton goods, or with high folding attachment to lay the goods off in loose

Curtis & Marble
Cloth Room Machinery, Continued.

folds. The rolling attachment is made with brass slides to go over the ends of the winding roll, with weights and cams to give pressure to make a firm, solid roll ; it is also placed at a convenient height from the floor for easily taking off the roll of cloth.

For goods where a very large amount is singed off, brushes may be added, if desired, to remove the burnt particles after singeing.

A Smoke-Hood may be attached over the top of the machine, arranged to be connected by piping to an exhaust or ventilating fan for carrying off all gases and products of combustion.

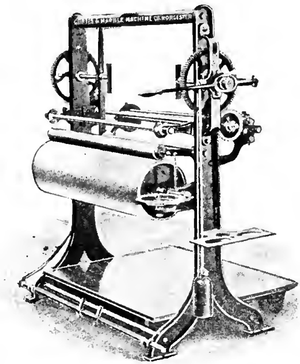
Where the Singeing Machines are run in connection with a Shearing Machine, as in print works, etc., an extra pair of draft rolls may be added in front to draw the cloth through the Shear, connected by bevel gearing to the back draft rolls, to maintain a uniform draft on the goods through both machines, without any excessive strain.

These machines are commonly made with two, three or four burners, as desired. A large number are running in mills making plain or fancy cottons, ginghams, worsted dress goods, upholstery goods, and in different finishing establishments, bleacheries, print and dye works, where almost all varieties of goods are being singed. For singeing corduroys and other pile fabrics, we build special Singeing Machines, working on the same principle as the above, but modified in form and construction, as the character of the goods requires.

Built in different widths for 30″, 36″, 40″, 44″, 50″, 60″, and 72″ goods.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble Cloth Room Machinery, Continued.



Cloth Winder and Measurer.

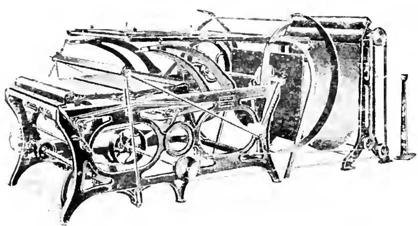
This machine is for winding cotton prints, ginghams, fancy cottons and other goods for the market, and it is made either with or without the Measuring Attachment. The machine without the Measurer is often run in connection with a Cloth Folder, on which the goods are measured, and will wind at the rate of 50 to 60 yards per minute, while the one with the Measurer is not usually run quite as fast, but accurately measures the goods as they are rolled up, and for general work is the more desirable machine. The tension is easily regulated by friction rods in front, and by means of the guide collars, the ends can be made perfectly square and even, making a neat looking roll. The machine is readily stopped and started by the foot of the operator upon the treadle-bar in front, and the boards quickly clamped and unclamped in the sockets by a hand-lever. The goods are generally wound on boards 4 to 9 inches wide, or on a square bar, or steel plate, which is pulled out after the goods are wound up; cardboard or a paper tube may also be used, if desired. Extra pairs of jaws for holding different widths of boards, etc., furnished when wanted. In ordering, the width of board used should always be given.

This is one of the best and most convenient Winding and

Curtis & Marble
Cloth Room Machinery, Continued.

Measuring Machines built, and is largely used by cotton and gingham mills, bleacheries, print works, dyeing and finishing establishments, etc., for almost all classes of goods.

The usual widths of these machines are 3-4 wide for goods up to 27 inches, and 4-4 for goods any width up to 36 inches. Wider and heavier machines are also made for goods 40, 45, 50, 60 or 72 inches wide.



Cloth Folding Machine.

(With Low Back Frame.)

This represents our Improved Cloth Folding and Measuring Machine, with low back frame and apron, as arranged for general work on ordinary brown goods, etc., for which we claim many advantages not found in other machines. The leaves of the table upon which the cloth is folded have a positive opening movement by means of cams and levers in advance of the folding-blades, so that the cloth is carried under the jaws without friction on the cloth already folded, and the work is done without pulling the cloth from the opposite jaw, or dragging the fold back when the blades are withdrawn from between the table and jaws The feeding-in of the cloth and the tension are easily regulated, and accurate measurement may be obtained, whether running at fast or slow speed. The swivel-rod for tipping the blades

Curtis & Marble

Cloth Room Machinery, Continued.

swings in a different manner from formerly, and is fitted with an oiling device for keeping the rod lubricated: guides are also provided for the blades as they move back and forth, to prevent any motion sideways.

Many minor improvements have been made in the construction, and the machine is built in a most substantial and accurate manner throughout, making it without question the best built Folder in the market. All parts operate with ease and rapidity, allowing the highest practical speed to be maintained.

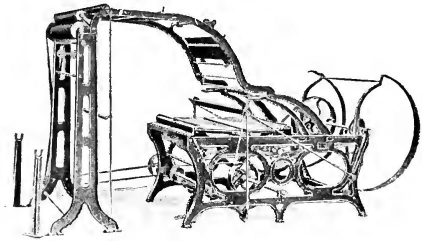
For folding extra long cuts, or for heavy or fluffy goods, we have a Patent Automatic Drop Centre Attachment, which lowers the centre of the table in a positive manner by means of a pawl and ratchet mechanism as the folds of cloth are laid under the jaws; the cloth is thus prevented from rounding up in the middle and so lengthening the folds towards the last end of the cut. As soon as a piece has been folded and taken out, the whole table is readily raised into position again by the foot lever, the same as on the plain machines. This Drop Centre movement is the most complete and easy working device for the purpose, and renders our machine the most reliable and accurate Folder for this class of work.

These Folders are also made with a curved cloth apron and nip-rolls on the upper part of the machine, over the back shaft, if desired, while for bleached or starched goods the cloth is usually fed in from the front side over the head of the operator, as shown on opposite page.

The machines are built for different widths of goods, and to fold in ½-yard, 1-yard, 1-metre, 1¼-yard, or 1½-yard folds, as required. Also Shifting Machines, which may be changed from one length of fold to another in a few minutes.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble Cloth Room Machinery, Continued.



Cloth Folding Machine.

(With High Front Frame.)

This represents our Improved Cloth Folding and Measuring Machine, as generally arranged for bleached or starched goods, etc., with High Front Frame to feed the cloth in over the head of the operator, for which we claim many advantages not found in other machines. Otherwise this folder is similar to the one with low back frame, described on a preceding page.

The Folders are also made with a Low Back Frame and Curved Cloth Scray back of the machine for ordinary brown goods, etc., or the Cloth Scray and Nip Rolls may be placed on the upper part of the machine over the cam shaft.

The machines are built for different widths of goods, and to fold in ½-yard, 1-yard, 1-metre, 1¼-yard, or 1½-yard folds, as required. Also Shifting Machines, which may be changed from one length of fold to another in a few minutes.

See "**Floor Plan and Notes**" for floor space required, sizes and speeds of pulleys, and production.

Curtis & Marble
Cloth Room Machinery, Continued.

Floor Plans and Notes.

The following floor plans are all based on goods 40″ wide. The floor space for 50″ or 60″ machines would therefore be approximately 10″ or 20″ wider than that given in the cuts, with a few inches added to allow for wider faced pulleys which are often used on wider machines.

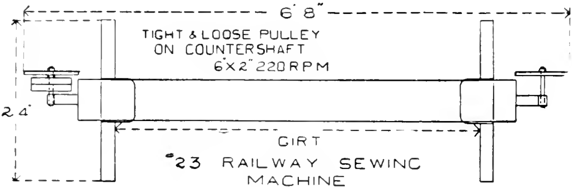
In some instances also the space occupied from front to back would be more for wider machines.

The cuts as shown, however, will no doubt answer for all ordinary purposes, and also serve as a guide in estimating floor spaces required by similar machines of different specifications.

Particular attention is called to the notes under each cut which give the usual technical data pertaining to sizes and speeds of pulleys, production of the different machines, and general remarks pertaining to floor plans and dimensions.

Curtis & Marble

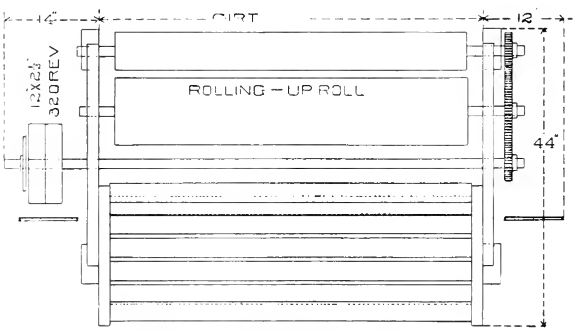
Cloth Room Machinery, Continued.



Floor Space for 40″ goods, 6′-8″ wide by 2′-0″ from front to back.

The **tight and loose pulleys** on the **countershaft** are 6″ diameter, 2¼″ face, and the usual speed is about 220 revolutions per minute; those on the machine itself are usually run about 500 to 525 revolutions per minute.

Production about 20,000 to 30,000 yards per day of ten hours.



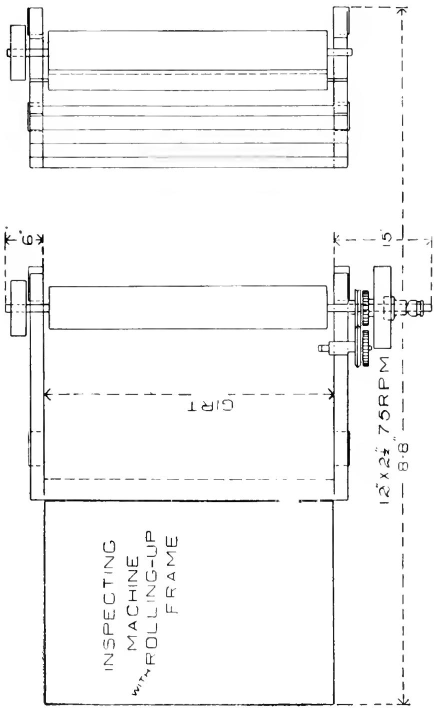
#25 RAILWAY SEWING & ROLLING
MACHINE

Floor Space for 40″ goods, 6′-10″ wide by 3′-8″ from front to back.

The **tight and loose pulleys** are 12″ diameter, 2½″ face, and the usual speed is about 320 revolutions per minute.

Production about 20,000 to 30,000 yards per day of ten hours.

Curtis & Marble
Cloth Room Machinery, Continued.



New style straight frames with rolling head.

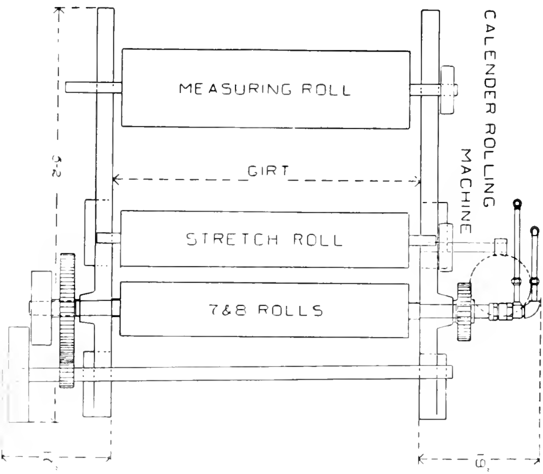
Floor Space for 40″ goods about 6′-0″ wide and 8′-8″ from front to back, including the platform 30″ wide which sets on the floor in front of the machine Without the platform the distance from front to back is about 6′-2″.

If necessary the rolling head can be moved up a little closer to the inspecting machine than shown on the drawing.

The **Friction Clutch Pulley** is 12″ diameter, 2½″ face and the usual speed is about 75 revolutions per minute.

Production of 42 yards of cloth per minute when running continuously.

Curtis & Marble
Cloth Room Machinery, Continued.



With Steam Vapor Cylinder, Stretch Roll, and Adjustable Measuring Attachment.

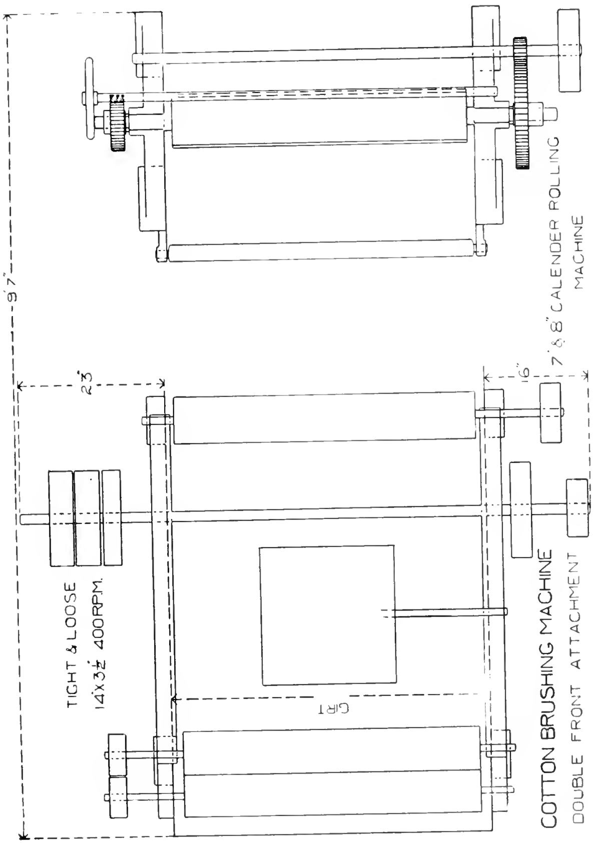
Floor Space for 40″ goods, 7′-0″ wide by 5′-2″ from front to back.

The **tight and loose pulleys** when the machine is used independently are 14″ diameter, 3″ face, and when running 270 revolutions per minute will give a

Production of 50 yards of cloth per minute.

When the Calender Rolling Machine is run in connection with the Brusher, it is driven directly from the Brusher.

Curtis & Marble
Cloth Room Machinery, Continued.



Curtis & Marble
Cloth Room Machinery, Continued.

Cotton Brusher and Calender.

Cotton Brusher with Emery Rolls, Beaters, Card Rolls and brushes for both sides of the goods, with 7″ and 8″ Steam Calender Rolling Machine with Steam Vapor Cylinder.

Floor Space for 40″ goods, 7′-3″ wide by 9′-7″ from front to back.

If Measuring Attachment is used on the Calender Rolling Machine, this adds about 18″.

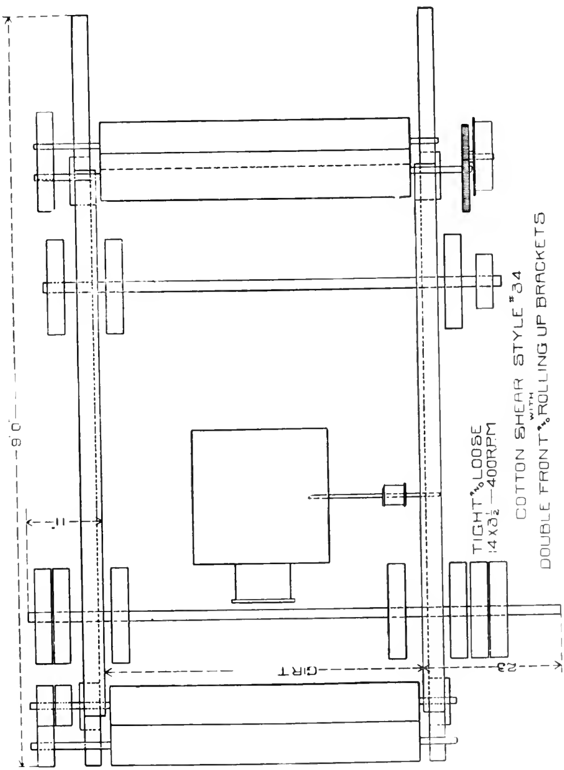
If Stretch Roll is used, this adds about 12″.

If Brusher is used with Rolling Brackets instead of the Calender Rolling Machine, the floor space is from 2′ to 3′ less from front to back.

The **tight and loose pulleys** are 14″ diameter by 3½″ face, and the usual speed is about 400 revolutions per minute.

Production about 40 to 60 yards per minute.

Curtis & Marble
Cloth Room Machinery, Continued.



Curtis & Marble Cloth Room Machinery, Continued.

No. 34 Combined Cotton Shearing and Brushing Machine.

With Emery Rolls and Beaters in front, Card Rolls, Brushes, and Shear Blades for both sides of goods on top, and Inclined Rolling Brackets at the back side for putting the goods on rolls.

Floor Space for 40″ goods, about 7′-0″ wide by 9′-0″ from front to back.

If used with Calender Rolling Machine, the floor space is about 3′-0″ from front to back.

If a Measuring Roll is used on the Calender Rolling Machine, this would add about 18″.

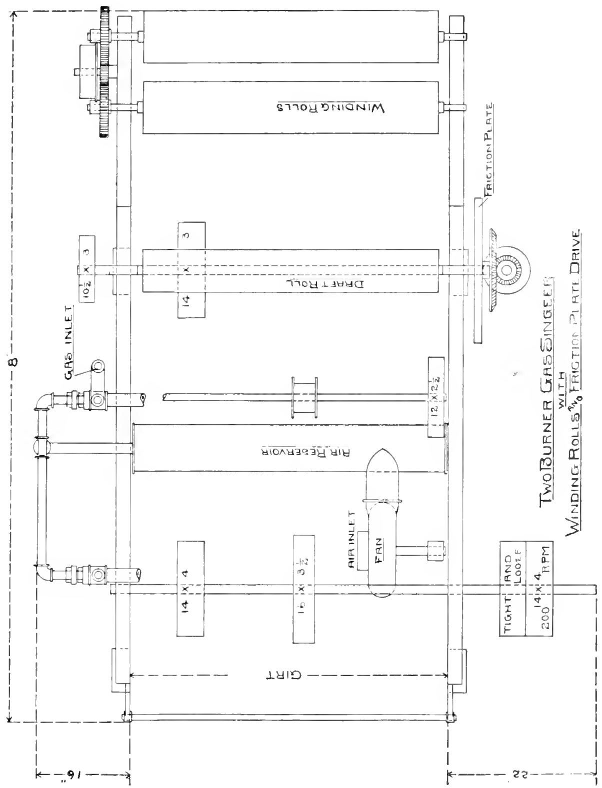
If the Stretch Roll is used, this would add about 12″.

On larger machines with additional brushes or shear blades on them, the additional floor space would be about 7″ for each additional brush, or 14″ for each additional set of shear blades.

The **tight and loose pulleys** on the machine are 14″ diameter, 3½″ face, usual speed about 400 revolutions per minute.

Production about 20,000 to 30,000 yards per day of ten hours.

Curtis & Marble
Cloth Room Machinery, Continued.



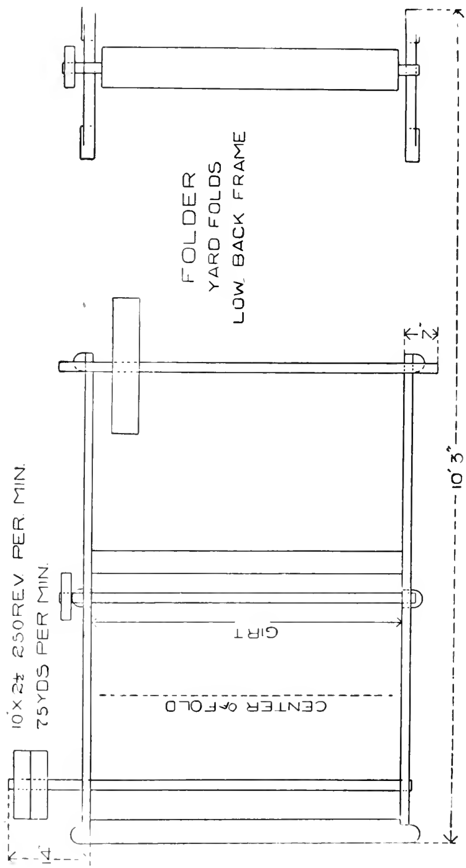
Floor Space of two burner Singer for 40″ goods, 8′-0″ from front to back by 7′-2″ wide.

Three and four burner Singers, 11′-6″ from front to back, by 7′-2″ wide.

The **tight and loose pulleys** are 14″ diameter, 3½″ or 4″ face, speed 200 revolutions per minute.

Production of 40 yards of cloth per minute.

Curtis & Marble
Cloth Room Machinery, Continued.



For Floor Space, Speed, Production, etc., see page 301.

Curtis & Marble
Cloth Room Machinery, Continued.

Folder Data.

Folder, to fold 1 yard folds, **with low back frame and curved apron** for the cloth :

Floor Space for 40″ goods, 5′-7″ wide by 10′-3″ from back to front. For 1¼ yd. folds, add about 12″ from front to back.

The **tight and loose pulleys** are 10″ diameter, 2½″ face, and the usual speed is about 250 revolutions per minute, which will give a

Production of 75 yards of cloth per minute.

Folder, to fold 1 yard folds, **with high front frame** to feed the goods in over the head of the operator :

Floor Space for 40″ goods, 5′-7″ wide by 10′-8″ from front to back.

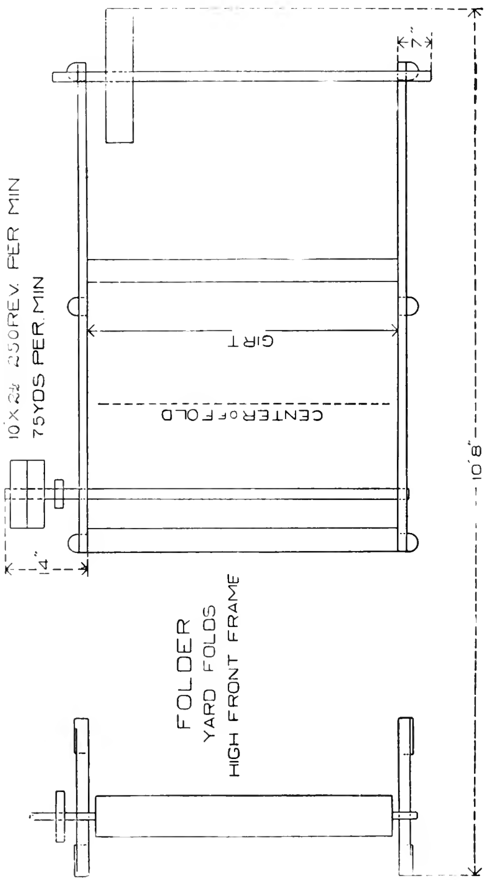
Machine to fold 1¼ yard folds, add about 12″ from front to back.

The **tight and loose pulleys** are 10″ diameter, 2½″ face, and when running 250 revolutions per minute will give a

Production of 75 yards of cloth per minute.

See "**Floor Plan**" on page 302.

Curtis & Marble
Cloth Room Machinery, Continued.



For Floor Space, Speeds, Production, etc., see page 301.

MAXIM GAS MACHINES.

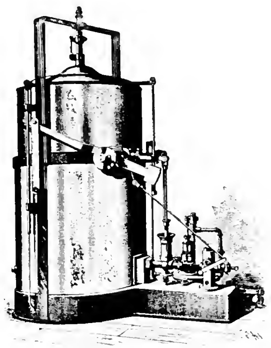


Fig. 1.

Gas lighting in textile mills has been practically abandoned. Electricity is the only thing used nowadays. At the same time, gas is occasionally required for singeing machines in finishing yarns or cloth. The best machine for this purpose is undoubtedly the Maxim. The special features claimed for it are as follows :

(1). Perfect uniformity in density and pressure.

(2) Entire absence of smoke or smell.

(3). For lighting purposes plain open burners can be used requiring no adjusting apparatus ; and Welsbach burners will give as satisfactory results as with coal gas.

(4). Its construction complies with regulations of the leading Fire Underwriters.

(5). The light is equal to that of the best coal gas.

(6). There is no accumulation of gasoline which will not evaporate, and the same quantity of gas is produced until the gasoline is consumed.

By referring to the accompanying cuts, the following description will make clear the construction and operation of the machine.

Maxim Gas Machines, Continued.

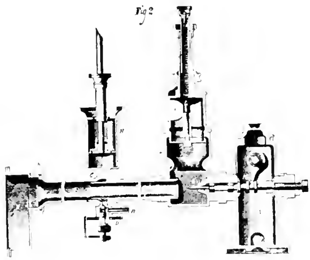


Fig. 2.

Fig. 1 shows the machine in perspective. Fig. 2 is a sectional view. The vertical cylinder is a common gas holder of sheet brass. It is 36 inches in diameter for a thousand burner machine. The operative parts of the machine are best shown in the sectional view, Fig. 2, which represents the portion of the machine called the injector. A is a steam chamber supplied with twenty or more pounds of steam through the pipe K. B is the gasoline supply pipe, and C the air supply. D is an index regulating the flow of the gasoline valve. The operation is as follows: Steam being in a chamber A, the descent of the holder opens the valve M, and allows the steam to escape through the jet L. This produces a partial vacuum at L, and draws in air at C. The air and steam pass with great rapidity through the tube G. The action of the air and steam produces another partial vacuum at N, which draws in gasoline through the pipe B. The adjustment of the opening is such that the steam draws in the proper quantity of air to make the quality of gas desired. The heat of the steam is taken up by the refrigeration caused by the evaporation of the gasoline, so that at E a compound of carburretted air and cold water is produced. The short piece of tube F presents the curious phenomenon of being a hot retort (at a) and a cold condenser (at b). The supply of gasoline is regulated by the valve D. The dash pot H prevents a too rapid action of the valve L. The gas is regulated to a density and pressure to suit the burners used, and when once adjusted does not vary in its quality.

Maxim Gas Machines, Concluded.

Technical Data.

Parties desiring gas machines for singeing purposes should give the estimated consumption of their burners and the number used.

Any size storage tank can be used in connection with the machine, as the gasoline is conducted directly from the storage tank to the machine.

Six gallons of gasoline are estimated to furnish 1,000 cubic feet of gasoline gas, which is the equivalent of a like quantity of coal gas.

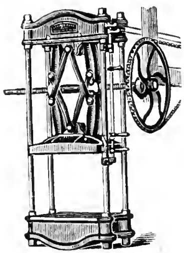
The two sizes of these machines that seem best adapted to the cotton mill trade are embodied in the following table:

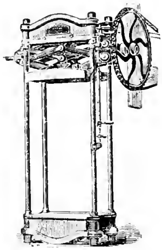
Size Number of Machine.	Capacity in Cu. Feet of Gas.	Dimensions of Room Required.		
		Width.	Length.	Height.
No. 2	2500	6 ft.	9 ft.	9 ft.
No. 3	5000	7 ft.	13 ft.	12 ft.

Note:—The dimensions give ample room to get around all parts of the machine.

BUSHNELL PRESSES.

(For Baling Cloth and Yarn.)



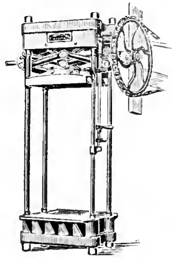


First Class Cloth Baling Presses.

The term "First Class" applies to our all iron and steel presses. It is a well known fact that there is nothing equal to a double knuckle jointed Press, where both power and rapid work are required. The above cuts represent our heaviest type of press with the follower both down and up to show the relative amount of piling room. This machine is specially designed for heavy work and adapted to baling goods for export, finishing ginghams, for use in print works, bleacheries, etc.

These presses are also made inverted when desired; it works as well in every respect as when standing up in the ordinary way. The belts and working parts are below the floor, the follower moving up as in hydraulic presses. The extra cost of an inverted press is about 10%.

Bushnell Presses, Continued.



First Class Cloth Baling Presses, Style M.

Our Style M. Press is the lighter type of our all iron and steel presses.

Hydraulic Baling Presses.

We also make Hydraulic Presses for baling and finishing purposes. They are supplied in the same sizes and pressure as our other first class presses; we furnish either power or steam hydraulic pumps to work with them.

Bushnell Presses, Continued.

First Class Presses.

Dimensions, Etc.

Style of Press.	No. of Press.	Distance Between Rods. Inches.	Distance Across Bed. Inches.	Piling Room for Goods. Inches.	Movement of Follower Inches.	Tons Pressure.
M	1	42	24	65	37	75
M	1-A	42	30	65	37	75
M	2	48	24	65	37	75
M	2-A	48	30	65	37	75
M	3	54	24	65	37	75
M	3-A	54	30	65	37	75
M	4	30	24			100
M	4-A	30	30	These columns refer		100
M	5	36	24	to Baling Presses only		100
M	5-A	36	30			100
M	6	42	24	72	44	100
M	6-A	42	30	72	44	100
M	7	48	24	72	44	100
M	7-A	48	30	72	44	100
M	8	54	24	72	44	100
M	8-A	54	30	72	44	100
M	9	60	24	72	44	100
M	9-A	60	30	72	44	100
	10	36	24	..	..	150
	10-A	36	30	..	..	150
	11	42	24	72	44	150
	11-A	42	30	72	44	150
	12	48	24	72	44	150
	12-A	48	30	72	44	150
	13	54	24	72	44	150
	13-A	54	30	72	44	150
	14	60	24	72	44	150
	14-A	60	30	72	44	150
	15	66	24	72	44	150
	15-A	66	30	72	44	150
	17	42	24	72	44	200
	18	42	30	72	44	200
	19	42	36	72	44	200
	20	48	24	72	44	200
	21	48	30	72	44	200
	23	48	36	72	44	200
	25	54	24	72	44	200
	26	54	30	72	44	200
	27	54	36	72	44	200
	28	60	24	72	44	200
	29	60	30	72	44	200
	30	60	36	72	44	200
	31	66	24	72	44	200
	32	66	30	72	44	200
	33	66	36	72	44	200
	34	72	24	72	44	200
	35	72	30	72	44	200
	36	72	36	72	44	200

Bushnell Presses, Continued.

First Class Presses.

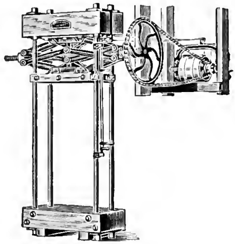
(Concluded.)

Dimensions, Etc.

Style of Press.	No. of Press.	Distance Between Rods. Inches.	Distance Across Bed. Inches.	Piling Room for Goods. Inches.	Movement of Follower. Inches.	Tons Pressure.
M	37	48	30	72	44	250
M	38	48	36	72	44	250
M	39	54	30	72	44	250
M	40	54	36	72	44	250
M	41	60	30	72	44	250
M	42	60	36	72	44	250
	45	48	30	72	44	300
	46	48	36	72	44	300
	47	48	42	72	44	300
	48	54	30	72	44	300
	49	54	36	72	44	300
	50	54	42	72	44	300
	51	60	30	72	44	300
	52	60	36	72	44	300
	53	60	42	72	44	300
	54	66	30	72	44	300
	55	66	36	72	44	300
	56	66	42	72	44	300
	57	72	30	72	44	300
	58	72	36	72	44	300
	59	72	42	72	44	300
	81	48	36	70	43	400
	82	48	42	70	43	400
	83	48	48	70	43	400
	85	54	36	70	43	400
	86	54	42	70	43	400
	87	54	48	70	43	400
	89	60	36	70	43	400
	90	60	42	70	43	400
	91	60	48	70	43	400
	105	48	36			500
	106	48	42			500
	107	48	48			500
	109	54	36			500
	110	54	42			500
	111	54	48			500
	113	60	36			500
	114	60	42			500
	115	60	48			500

Figures in these columns refer to Baling Presses only.

Bushnell Presses, Continued.



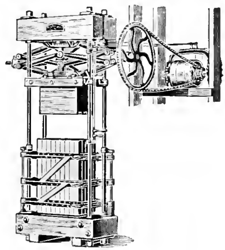
Third Class Baling Presses.

The above cut represents our Third Class Baling Press. The head, follower, and bed beams are made from selected timber, finished in varnish on the natural wood. The working parts are of the same quality as those used on our First Class Presses. While these presses are not so powerful as the all iron presses of the same size, they have the merit of being somewhat less expensive, and where light pressures only are desired, they make a very good substitute.

Dimensions, Etc.

No. of Press.	Distance Between Rods. Inches.	Distance Across Bed. Inches.	Piling Room for Goods. Inches.	Movement of Follower. Inches.	Tons Pressure.
391	42	24	55	29	70
392	48	24	55	29	70
393	54	24	55	29	70
395	42	24	65	37	70
396	48	24	65	37	70
397	54	24	65	37	70
398	60	28	65	37	70
401	42	24	73	44	70
402	48	24	73	44	70
403	54	28	73	44	70
404	60	28	73	44	70
405	66	28	73	44	70
415	42	24	73	44	100
416	48	24	73	44	100
417	54	24	73	44	100
418	60	28	73	44	100
419	66	28	73	44	100
420	72	28	73	44	100
422	48	30	73	44	150
423	54	30	73	44	150
424	60	30	73	44	150

Bushnell Presses, Continued.



Combined Cloth and Yarn Presses.

The above cut shows a Third Class Press designed for baling yarn, cotton waste, etc., and which can also be utilized for baling cloth. This press is especially adapted for mills making both cloth and yarn. The baling box can be opened entirely out of the way, leaving the press available for baling cloth.

Instead of the baling box swinging open, we can make a less expensive box of which the sides and ends drop. Of course, it is not so convenient, however, as the other type.

Dimensions, Etc.

No. of Press.	Length of Box in Inches.	Width of Box in Inches.	Height of Bale in Inches.	Approximate Weight of Bale in Pounds.	Distance Between Rods.	Movement of Follower.	Tons Pressure.
353	24	24	20 to 24	220 to 270	48	44	70
354	24	36	18 to 26	300 to 425	54	44	70
355	24	36	18 to 26	325 to 450	54	44	100
356	24	42	20 to 26	375 to 500	60	44	100
357	24	48	24 to 30	500 to 675	66	44	100
358	30	30	30 to 36	500 to 625	54	44	100
359	30	36	30 to 36	600 to 725	60	44	100
360	30	42	34 to 40	800 to 950	66	44	150

Bushnell Presses, Continued.

Power Attachments.

Two classes of attachments are furnished with these presses.

Each has three pulleys, one fast and two loose, requiring two belts, one to run the press up, the other to run it down.

Ordinarily a driving chain is used to connect the power attachment to the press: when very rapid work is required of light pressure presses, a belt and pulleys can be substituted for chain and sprocket gears.

The No. 2 power attachment is similar to the No. 1, except it has in addition gears and an extra shaft for increasing the power of the press for heavy work. This attachment is used without gears for driving presses style M, No. 37 to 59 inclusive; and with gears for driving presses No. 81 to 115 inclusive.

Size of **Pulleys** on Power Attachments are as follows:

Style of Press.	Size of Press. (Tons Pressure.)	Attachment Used.	Size of Pulleys. No. 1 Attach.	Size of Pulleys. No. 2 Attach.	Revolutions per Minute.
First Class, Cloth	75	No. 1	3 pulleys for 4'' belts; total face 13½''; diameter 16''.	3 pulleys for 5'' belts; total face 17½''; diameter 26''.	200
First Class, Cloth	100, 150 & 200	No. 1			250
First Class, Cloth	250	No. 2			225
First Class, Cloth	400 & 500	No. 2			300
Third Class, Cloth	70	No. 1			200
Third Class, Cloth	100 & 150	No. 1			250
Cloth & Yarn, Combined	70	No. 1			200
Cloth & Yarn, Combined	100 & 150	No. 1			250

In the **Diagrams** on the following page:

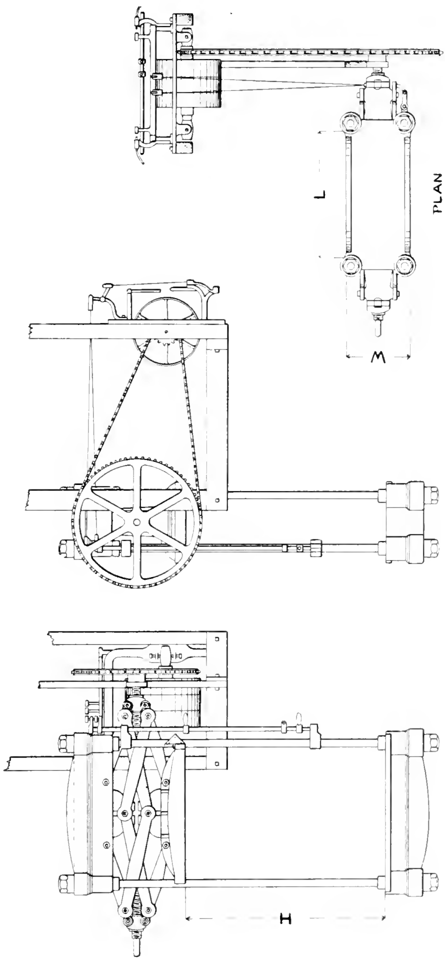
H=Piling Room for Goods.

L=Distance between Rods.

W=Distance across Bed.

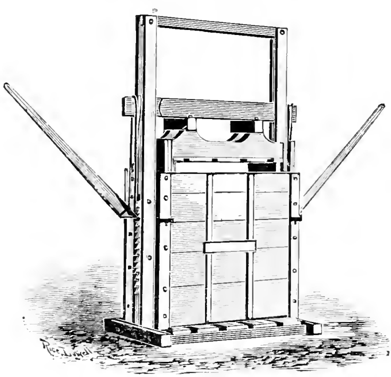
The above lettered dimensions representing height, length and width available for use in these presses, can readily be taken from the foregoing tables pertaining to the different styles.

Bushnell Presses, Continued.



Diagrams.

Bushnell Presses, Continued.



Hand Baling Press for Waste.

This press is specially designed for handling cotton waste, and can be located in either the waste house or the cotton warehouse, for no power is required to operate it. It makes a neat, firm bale, that is much more conveniently handled than waste in sacks would be.

It is made in two grades :

The "**Common**" grade is made with hard wood posts, sills sills, beams, follower, and levers. The 24″ x 48″ is the size of this press most frequently used.

The "**Special**" style of this press is made of hard lumber, with heavier posts, follower, beam, and levers, and with new pattern and heavier racks and forgings. The sizes usually sold of this are 24″ x 48″, 24″ x 54″, and 30″ x 60″.

Bushnell Presses, Concluded.

Hand Presses.

Dimensions and Floor Space.

24x48 inch Common Press is 5 ft. 4 in. x 3 ft. 8 in.
24x54 inch Common Press is 5 ft. 10 in. x 3 ft. 8 in.
24x54 inch Special Press is 6 ft. x 3 ft. 10 in.

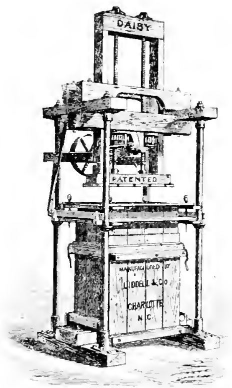
Height of press usually 9 ft.
If wanted for low studded room, give height desired when ordering.
Usual height of sides is 4 feet 3 inches—can be made 5 feet to 6 feet if desired.

One person with a 24x48 inch press can make a bale 2x4 feet, weighing about 500 pounds.

Standard Sizes.

COMMON.			SPECIAL.		
Size in inches.			Size in inches.		
21 x 36	24 x 42	27 x 48	24 x 48	27 x 48	30 x 48
21 x 42	24 x 48	27 x 54	24 x 54	27 x 54	30 x 54
21 x 48	24 x 54	30 x 48	24 x 60	27 x 60	30 x 60

LIDDELL YARN PRESS.

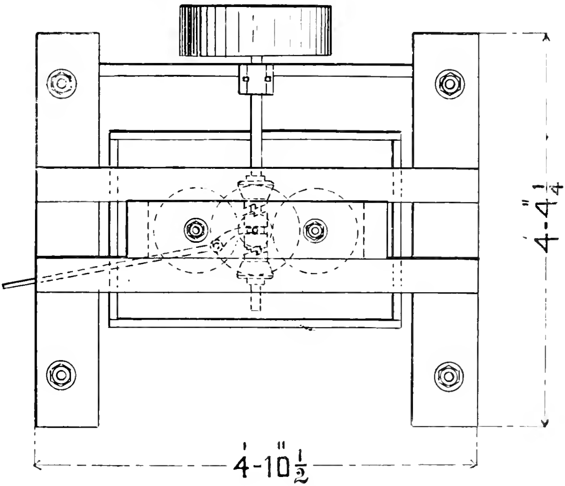


This Press is known to the trade as the Daisy Yarn and Warp Press. It is the best known and most widely used screw power type of Press, and is specially adapted to the use of small yarn mills.

The principle consists in the use of the tensile or pulling strength of the screws, the ratio of which to the pushing strength is as 34 to 16.

The pulley can be driven from the main shaft, the Press being moved up or down, or allowed to run idle by means of a direct and positive clutch arrangement, which has been successfully tested on all our Presses. When it is desired to use the Open Press, the doors and box can be easily removed without disturbing the other parts and extra platens are furnished for the open bales.

Liddell Yarn Press, Concluded.



Floor Plan.

Specifications of Yarn and Warp Press.

Height over all	in feet,	9½
Depth of Box	in feet,	4⅓
Length of Box	in feet,	3
Width of Box	in feet,	2
Size of Pulley	in inches	20x6
Usual number of revolutions of Pulley		200
Weight in pounds, about		2500

Preface to Sections II., III., and IV.

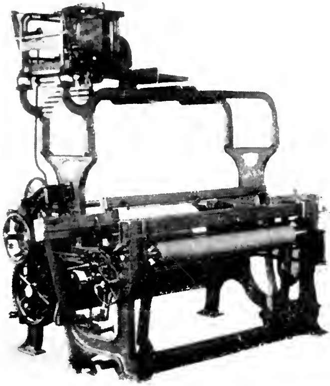
The preceding pages cover the textile machinery ordinarily installed in a yarn or cloth mill on plain work.

The additional machinery required for dyeing and special finishing will be found in **Section III.**

Section II. includes sundry and miscellaneous equipment and power plants.

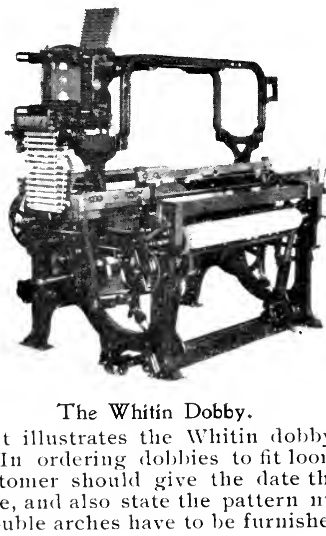
Section IV. contains general technical and miscellaneous information, with notes on Cotton Manufacturing, Mill Engineering, etc.

APPENDIX
and
Table of Contents.



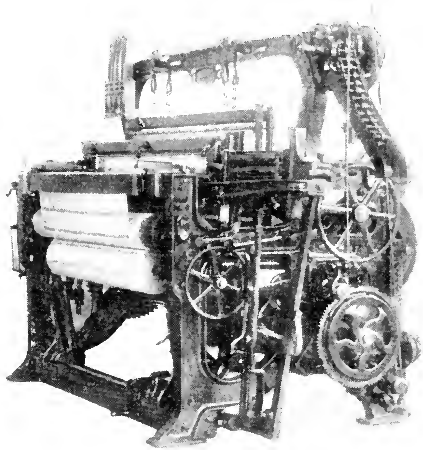
The Whitin Silk Loom.

This loom is designed for weaving fine cotton or silk dress goods. It is fitted with a horizontal dobby of 36 harness capacity, Owen beam lock, Bartlett let-off, Draper thick and thin place preventor, and Owen high cloth roll motion with direct wind.



The Whitin Dobby.

The above cut illustrates the Whitin dobby applied to a Whitin loom. In ordering dobbies to fit looms already installed, the customer should give the date the looms were made, if possible, and also state the pattern numbers of the loom sides. Double arches have to be furnished in all cases.

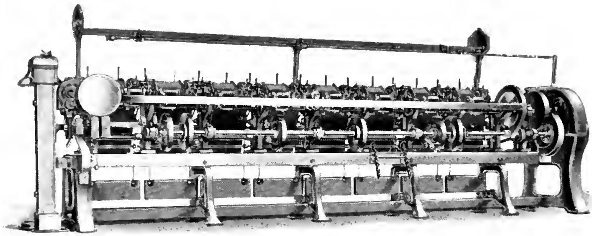


The Whitin Gingham Loom.

This loom is particularly adapted for weaving ginghams, cottonades and plaids. It has the ordinary cam harness motion consisting of a short auxiliary cam shaft geared to the main cam shaft so that two, three, four, five, or six shed work may be woven.

The box motion is the well-known **Crompton motion** for four shuttle boxes on one end of lathe and one on the other end. The shuttle boxes are carried positively into their proper positions by means of sliding gears, and eccentrics combined with a lifting lever, motion being imparted to the sliding gears by a mutilated gear operated from the main cam shaft. The changing of the boxes is accomplished by means of a connection between the sliding gears and pattern chain mechanism A break-down motion is provided to prevent any damage to the shuttle boxes or box motion due to a picker sticking or a shuttle failing to enter a box. The pattern chain mechanism is fastened to the arch and is driven by suitable connection with main cam shaft. A simple "multiplier" motion for reducing the length of pattern chain may also be used in connection with the pattern chain motion.

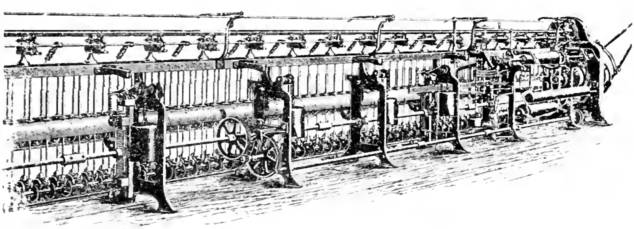
This loom may be made of various standard widths, with either standard or Ponemah sides, and fitted with any let-off or take-up motion desired. A friction pulley is generally preferred for driving this loom, but tight and loose pulleys may be had if desired.



The New Whitin Eight-Head Comber.

The above cut illustrates the new Whitin eight-head comber. The advantages in favor of such a machine with eight heads instead of six, are obvious,—not to mention the fact that the new comber takes laps $10\frac{1}{2}''$ instead of $8\frac{3}{4}''$.

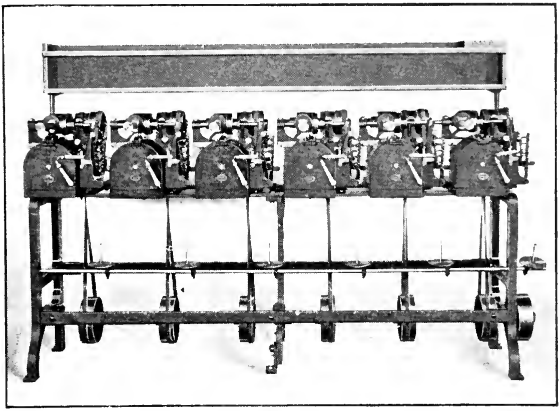
Otherwise the description for the six-head comber on pages 75–81 applies as well to the eight-head machine as to the one with six heads.



Woonsocket Roving Frames.

(The New Center Lift.)

The above cut illustrates the new method of driving lifting shaft. It will be noticed that instead of driving at the head end direct to the lifting shaft, as formerly done, the power is now taken from about the center of the frame, therefore balancing the strain on the lifting shaft.

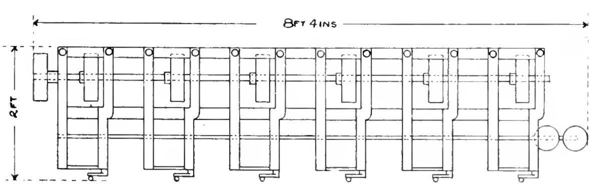


Foster Close Winder.

The above cut illustrates the new Foster Close Winder. The Foster people advocate close winders only for certain classes of work, maintaining that the majority of the hosiery yarn trade prefers the open wind for the soft yarns they use.

Attachments can be applied to the above machine to wind any length of cone from 1″ to 6″ traverse ; the 2½″ traverse machines have two tubes on one spindle, and the 2″ traverse have three tubes on one spindle.

The driving **pulley** is 8″ diameter by 2″ face, making 500 revolutions per minute.



The above diagram shows the **floor space** required for one gang of six spindles ; these machines are both constructed and shipped in gangs of six spindles ; they are, however, so constructed that there can be any number of gangs to one frame, all being driven from the head by one driving pulley.

Table of Contents.

Volume I.

Section I.

Appendix.